US BATTLESHIPS 1941-1963

an Illustrated Technical Reference

Second Edition

Text and Illustration
by
Wayne Scarpaci

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battleships as art

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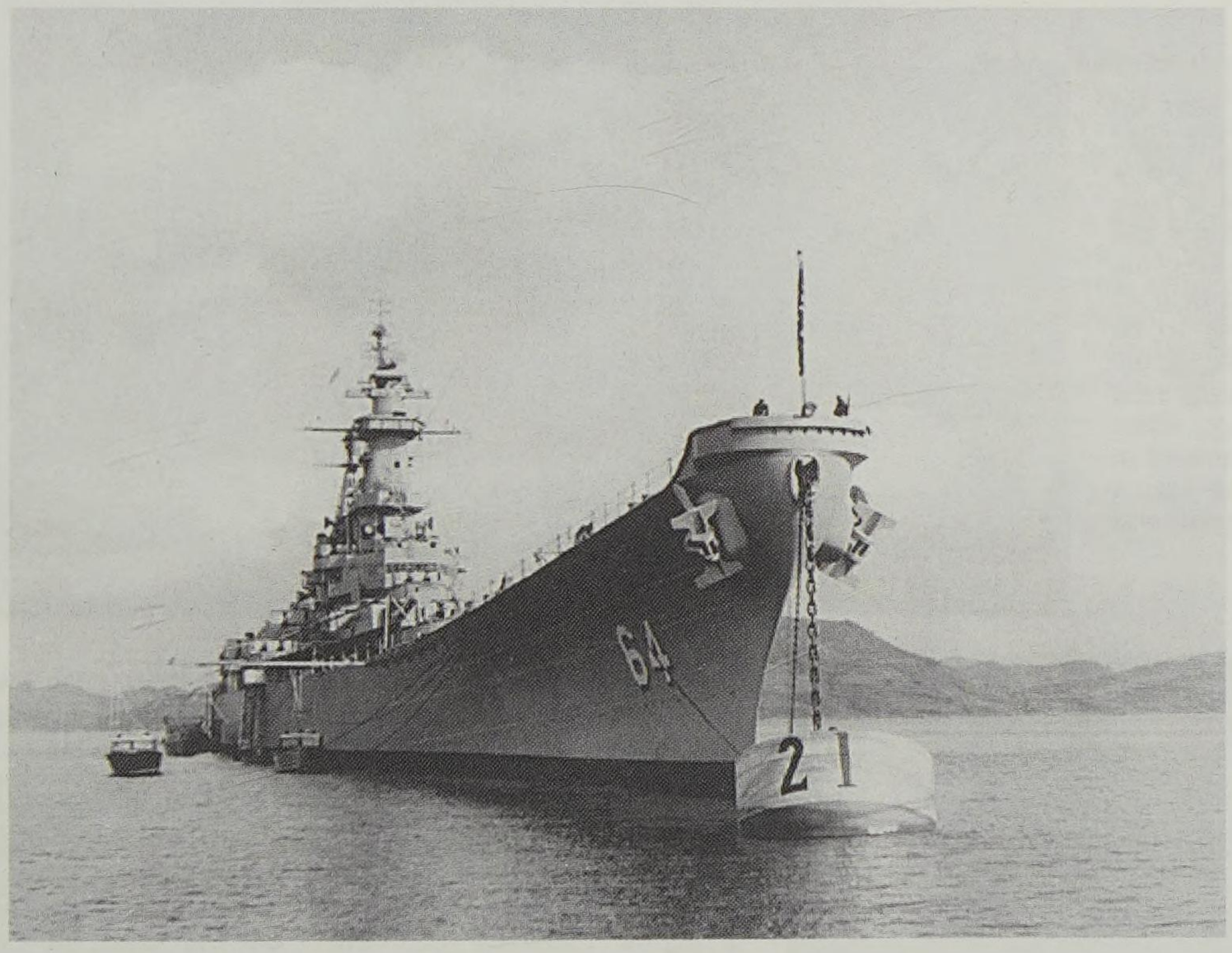

Circa 1956 Yokosuka Japan. USS Wisconsin BB64. Note the overhanging forward guntub inherited from the USS Kentucky BB66 in May 1956, and the 4 legged mainmast topped with an AN/SPS8A Height Finder radar. The ship is painted Measure 13 Overall Haze Gary with Deck Gray steel decks and unpainted teak main and 02 decks. Hull numbers are the standard, from 1952, postwar 6' White with Black shadowing. Upon completion of this Western Pacific (WestPac) deployment BB64 transferred to the East Coast and remained stationed out of Norfolk VA until decommissioned in Dec 1958 at Bayonne NJ.

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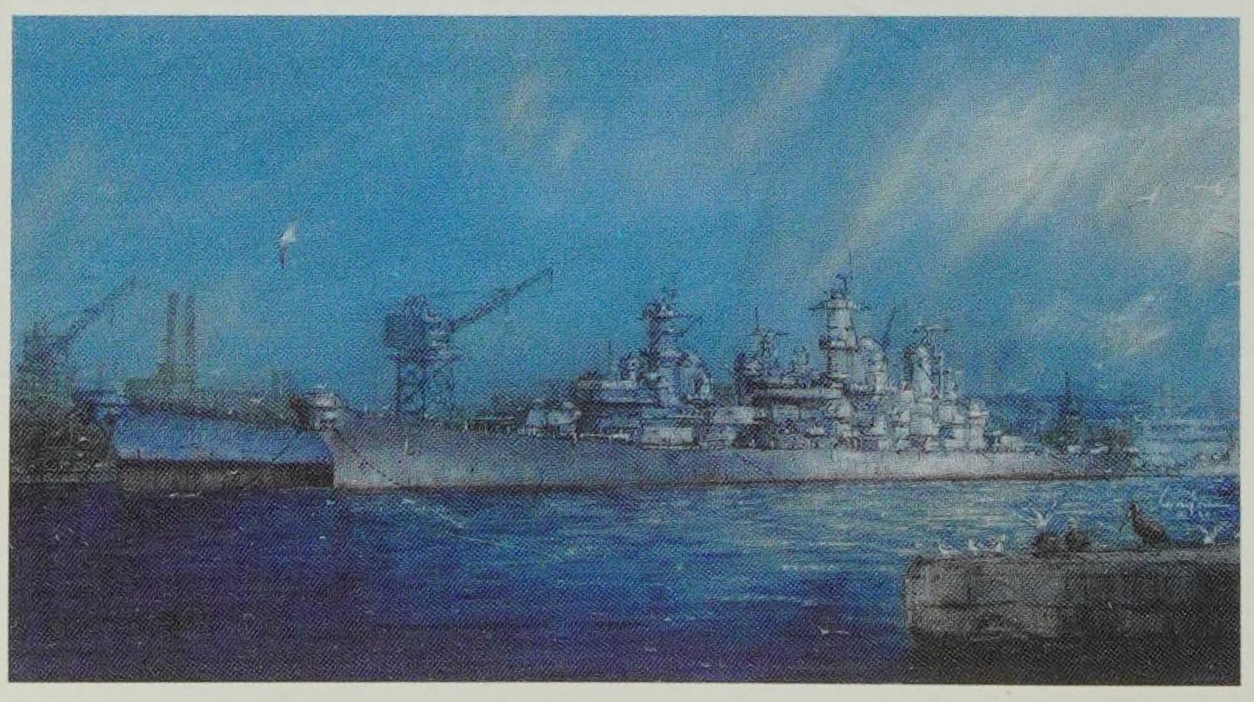
Printed and bound in the United States of America

Dedication: This volume is dedicated to my beautiful wife Swarn Kaur
Without whose patience and encouragement this volume would not have been possible

The author also wishes to thank long time friend (since 1962) and Naval Historian
David A Buell.
For contributions of photographs (credited as dbc). Also for the review of, and comment on the manuscript.

Book Format Design and Layout by Wayne Scarpaci

Front Cover: **"Kamikaze"** 6 Apr 1945 USS Missouri BB63 under kamikaze attack while escorting the third fleet conducting operating against the Japanese Home Islands. When the kamikaze struck it ignited a huge fireball that mushroomed into a cloud of smoke and debris high above the masts of the ship. However, the resulting fire was brought under control in less than 15 minutes, and damage from the attack proved to be minimal. While the ship was not seriously damaged, the battlescars of that kamikaze attack gouged into the steel side plates of the ship remain visible today, silent poignant reminders of the past. The Missouri arrived in the Pacific Theater somewhat late in the war seeing action for the first time in Feb 1945. The Missouri was the last USN battleship to be completed.



Back Cover: **"Quite Backwaters"** Oct 1960 USS Iowa BB61 Inactive Ship Facility Philadelphia Naval Shipyard. Mothballed, and moored empty, alongside mothballed sister ship USS Wisconsin BB64. With the exception of the New Jersey's 1968-69 Vietnam Tour, the Iowa class ships were idle in the decades of the 1960's and 70's. But at the sound of an unexpected recall, the four Iowa's were returned to service in the early 1980's to operate as fleet battle units during the final tense years of the Cold War. Often the mere presence of a battleship was enough to deter Communist aggression. They proved instrumental in assisting to end the Cold War. But for now the guns are silent, cocooned, engines preserved in grease, sensitive electronics removed, and dehumidifiers pump in dried air to help retard any internal decay, while electrified cables around the hull provide cathotic protection against rust and encrustation by Marine Life.

Author's Forward

This volume is a concise single source reference which provides appearance, statistical, and reference data on each USN class of battleship design, and on the individual units within each class from 1941-1963.

This book presents sections on classes of ships which were canceled and/or not completed dating back to the immediate post WWI era. By strict definition the South Dakota BB49 battleships and Lexington class CC1 battlecruisers of 1920 fall outside the 1941-1963 timeline of this volume. However, they have been included to establish the continuity of the 2nd generation designs to the preliminary 3rd generation designs. There is also a section that provides an overview of the Washington Naval Treaty of 1922, as it had so much impact on WWII USN Battleship design. Also included are the 6 canceled ships of the Montana class of 1940. New original artwork of the above uncompleted designs allow for the visualization of the appearance of these ships had they been completed.

Also included in this work are the Large Cruisers (Battlecruisers) of the Alaska class, as they were by definition capital ships incorporating battleship size and design characteristics. They also qualified for inclusion as per the definition in the Washington Naval Treaty of 1922 which stated that any vessel over 10,000 tons standard displacement, mounting a main armament in excess of 8" guns is a Capital Ship.

The 1967-1969 deployment of the USS New Jersey BB62 and the 1980-1990's modernization and deployment periods of the Iowa BB61 class ships falls outside the timeline of this book, and are therefore not covered.

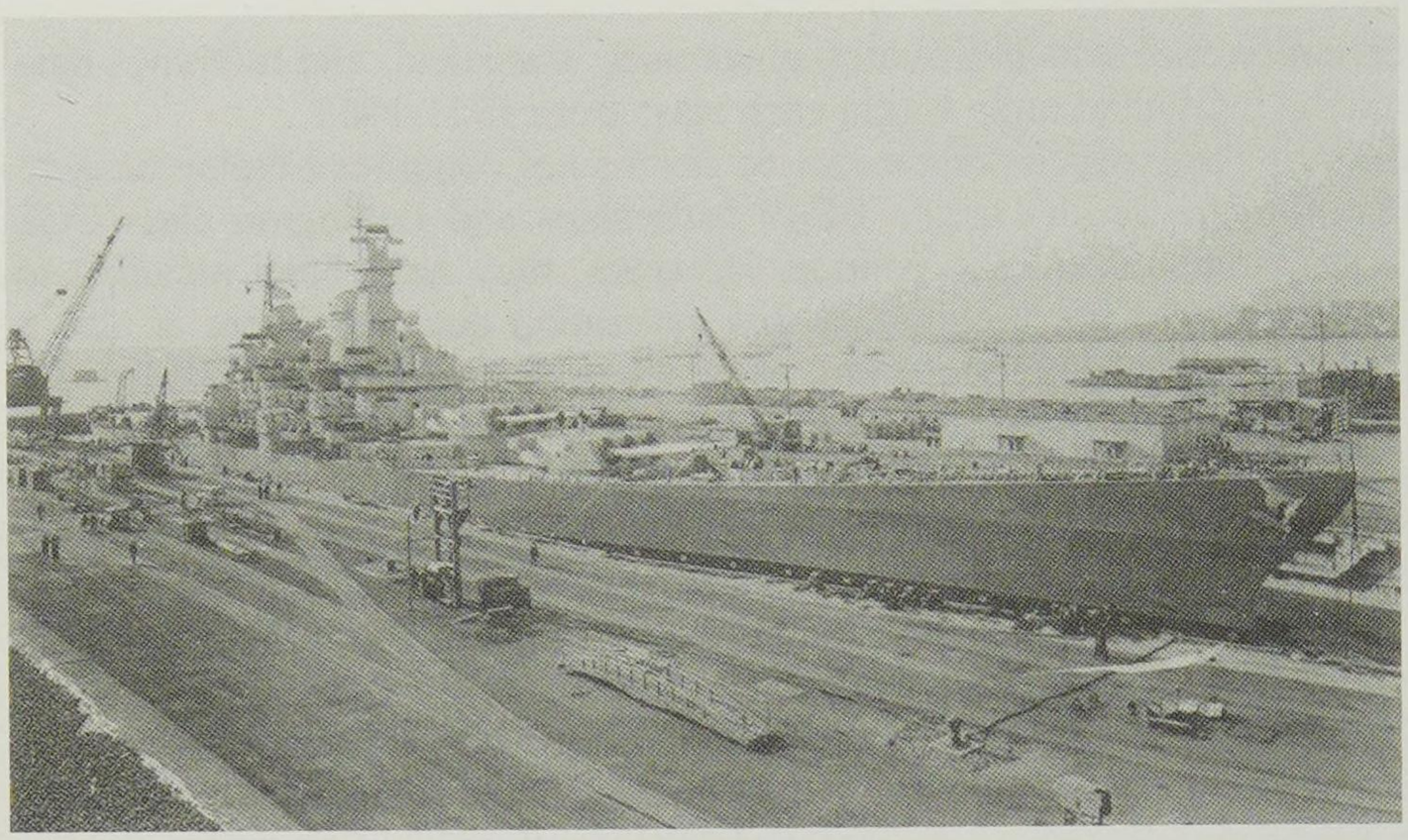
This book is organized chronologically by the ship's class, and hull number. Standard USN terminology is use throughout (Glossary Pg 137). English measurement units are used. Visual, textual, and statistical data presented in this volume have been drawn from numerous reference sources (Bibliography Pg 138), and is believed to be accurate to the best available resource information. Wherever possible, contradicting data, and/or dates, in the resource material were crosschecked with original photographs, and/or source data. And when required, source information was checked with the personnel who were directly involved with the ships. However, any errors or omissions are the responsibility of the author.

In the halcyon days of the interwar years a Brown Bear Cub named "Yosemite Prunes" was the mascot of the USS California BB44. "Prunes" acquired his name from the nickname for the Battleship California known as the "Prune Barge. This was in deference to one of the main crop exports which the state of California was known for in the 1920's and 30's. Operating out of San Pedro CA, the normal peacetime routine of the Battlefleet was a cycle of yard periods, gunnery exercises, and the Annual Fleet Problem. Fleet Problem XIII of 1932 was an Air Raid by a 150 aircraft from the Fleet Carriers against the Battlefleet moored at Pearl Harbor. The Battlefleet was judged as "destroyed" in the exercise.

Notes on the Artwork

This volume is illustrated with 52 original paintings and 87 line drawings by the author depicting each completed, modernized, and canceled, capital ship of the USN 1941-1963. All artwork in this volume is rendered with brushes, freehand with acrylic polymer paint media on pre-stretched canvas panels, the size of the canvases range from 12"x16" to 24"x36". Each painting or drawing has been carefully researched from source photographs, reference drawings, and official camouflage design sheets, then checked, and rechecked against photographs for accuracy. The art is composed to recreate realistic scenes, yet, in each painting a certain degree of artistic license has been exercised to keep the subject vessel in an interesting dynamic composition. The artist has tried to minimize the use of artistic license, but as I wished to see each composition a dynamic image. Some artistic license has been employed, but I have tried to insure that each ship is still portrayed accurately. Wherever possible the art depicts the proper sea states, sun location, lighting, weather conditions, and background settings appropriate to a specific locale and/or action.

Introduction to the battleships of the US Navy 1941-1963



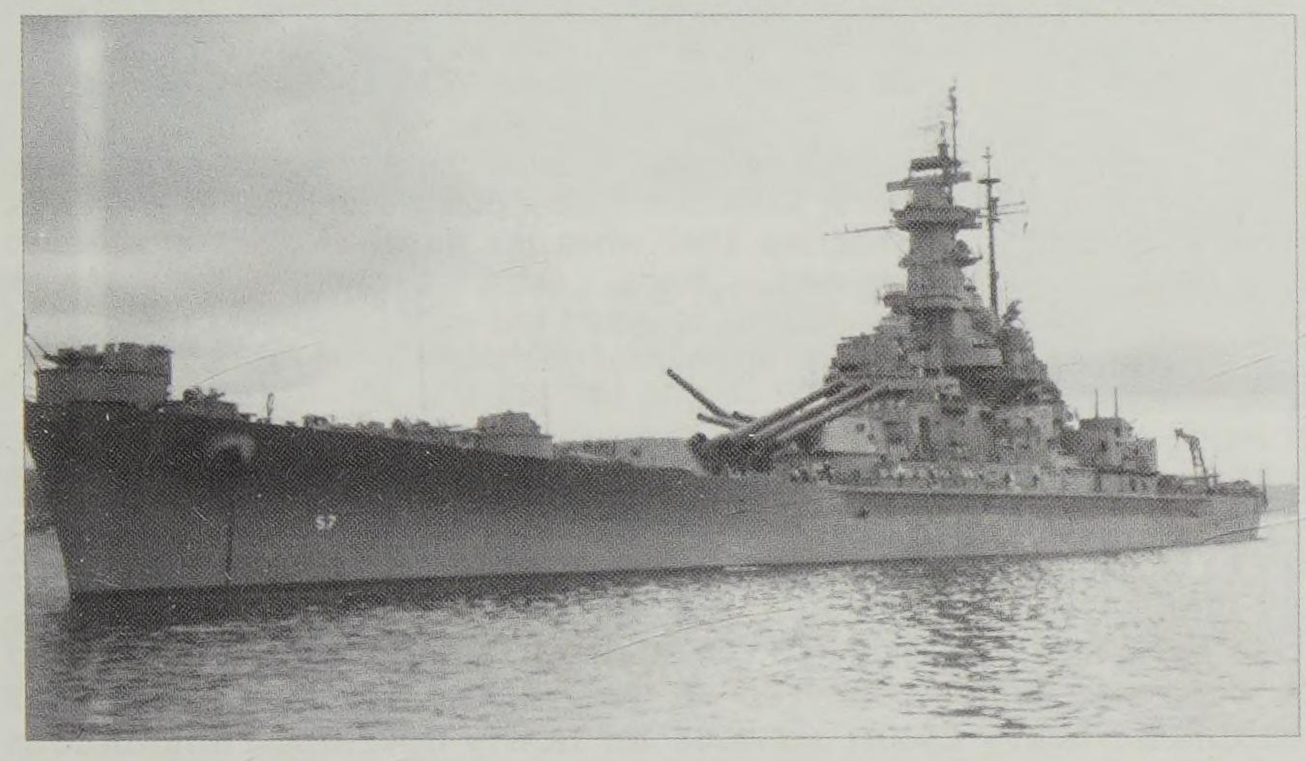
28 Mar 1943 New York NSY. USS Iowa BB61 during incline testing. Which used concrete wheeled trolleys on transversely mounted tracks to determine the stability characteristics profile of the ship's class design. BB61's camouflage is Ms22 Graded System painted in an Ocean Gray Hull with Haze Gray upperworks. Note the lack of a bow 20mm guntub and the 20mm mounts atop turret 2 and on the forecastle. These items were changed in Jul 1943 at Boston NSY. The ship has no hull number painted on the bow.

Overview: On the eve of the United States' entry into World War II, the Battleship was viewed by most officers in the World's Navies as the supreme instrument of national military power, directly equating to the ability of the nation to first and foremost, protect the national borders and national interests from attack. They were also the instruments that provided the capability to project military power to engage, and defeat a hostile nation's battlefleet far from home waters. After the attack on the battleships at Pearl Harbor December 7th 1941, the importance of the battleship's role to the fleet, become secondary to that of the Aircraft Carrier's. The new fast 3rd generation battleships were forced to assume a supporting role to a then new type of aerial combat tactics, centered around the aircraft carrier task force. While the older 1st and 2nd generation battleships were deployed as escorts and amphibious fire support ships. In early 1942 carrier based striking forces were a relatively new and untried concept, and there was reluctance on the part of some staff officers on both sides of the Pacific, to suddenly rely on the unproven sea borne aircraft, and fast carrier tactical concepts, versus the traditional heavy gun tactics of battleships and the battleline. Thus, "Battleship Culture" continued to remain embedded in the conservative administrations, and policies of the world's navies. New battleship construction continued unabated (albeit at a reduced priority level) in the world's navies throughout the war, and well into the postwar years. The British Vanguard and the French Jean Bart being examples of capitals ships completed in the Postwar Era. As late as 1945 FADM King remarked that he "could not support the complete cessation of BB construction" when referring to canceling further construction work on USS Kentucky BB66 which was scheduled for completion in 1947. This statement probably accounts for BB66's construction being suspended in 1946, rather than the outright cancellation of the ship.

The USN's WWII construction programs resulted in the completion of 12 of the finest and most powerful Capital Ships the world had ever seen, 2 North Carolina class, 4 South Dakota class, 4 Iowa class, and 2 Alaska class. Unfortunately due to increases in size and complexity of these ships, they had become so expensive, with each ship representing a significant national investment in time, material, manpower, and funding, that the loss of such a valued asset became tantamount to a national disaster. These factors led to reluctance by fleet commanders to commit such significant ships to action against their own types, much less exposing them to air attack without proper air cover. Therefore, the USN along with most of the world's navies became very conservative in tactical deployments of expensive and politically sensitive battleships during the Second World War. Many senior USN and Japanese Staff officers as late as 1944 still expected the outcome of the war in the Pacific to be determined in a decisive surface action between battleline. Which would take place in the Western Pacific, a realization of the pre-war battleship based War Plan Orange. These were the same basic concepts as to what had been expected to take place in the North Atlantic between the British Grand Fleet and the German High Seas Fleet during World War I. The indecisive confused WWI Battle of Jutland was not the decisive engagement which had been expected to lead to almost immediate victory of the war for nation of the victorious fleet. But ultimately, in WWII, as in WWI, the opportunity for a major battlefleet surface action between battleships never arose.

USN battleships participated in 3 surface actions against enemy BB's during WWII. The 1st was during the North African Landings against the incomplete and immobilized French BB Jean Bart on 8 Nov 1942 when the USS Massachusetts hit the Jean Bart jamming turret 1. The 2nd was during the battles for control of the waters around the Solomons Islands on 12 Nov 1942 in which the 3rd generation, USS Washington sank the Japanese 2nd generation BB Kirishima. The 3rd was in Surigao Strait in the Philippines on 25 Oct 1945, in which 6 USN 2nd generation BB's (BB38 BB41 BB46 BB43 BB44 BB48) sank 2 Japanese 2nd Generation BB's (Fuso Yamashiro) in a classic "crossing the enemy fleet's "T" " night action while sustaining no damage to the USN BB's.

The Fast Battleships: (BB55 BB57 BB67 CB1 classes) After the carrier air attack on the Italian Battlefleet at Taranto on 11 Nov 1940, which left 1 BB lost and 2 severely damaged. The loss of the German BB Bismarck after carrier aircraft torpedo damage on 27 May 1941. The Pearl Harbor carrier air attack of 7 Dec 1941 with the loss of 2 BB's and the damaging of 6 BB's. Coupled with the loss of the British Battlecruiser Renown, and the new British Battleship Prince of Wales to land based torpedo aircraft on 10 Dec 1941 off Malaya Peninsula. The results of these actions only served to underscore the increasing vulnerabilities of the Capital Ship to air attack. As the presence of operational USN battleships in the Pacific virtually disappeared overnight after the Pearl Harbor Attack. The USN was forced to rebuild it's primary defensive, and offensive striking power around the 6 operational fleet carriers (CV2 CV3 CV5-CV8), deployed in fast carrier task forces. Initially escorted and supported only by cruisers and destroyers during the critical Battles of Coral Sea and Midway. Starting in late 1942 the carrier escort forces were joined by the first of the new battleships of the 3rd generation North Carolina and South Dakota classes. The 2nd generation BB's were not deployed with the carriers as their 21knt speed limitation was considered inadequate to operate effectively with the 33knt Carrier Task Forces.



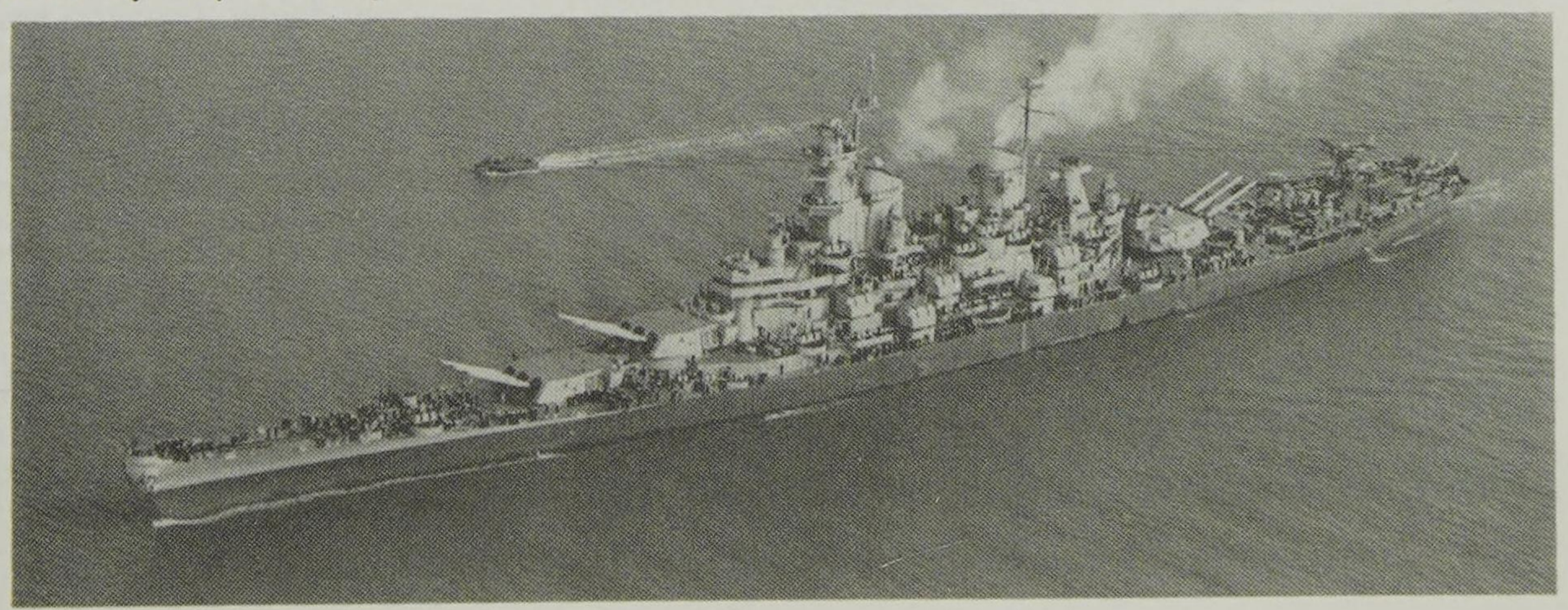
Left: 25 Aug 1944 Puget Sound. BB57 after completion of overhaul. The appearance of the ship has changed little from pre-overhaul configuration. 3rd generation ships generally received minimal changes to overall appearance from mid-1943 onwards. Upgrades fitted consisted primarily of the addition of 20mm positions and upgrading to improved radars. BB57 mounted only 8 twin 5"/38 DP's mounts vs. the 10 fitted to BB58-BB60. This was to allow space to provide fleet flag quarters aboard BB57.

The new USN 3rd generation BB's mounted nine 16" main guns in 3 triple turrets, 16-20 5"/38 DP guns in twin mounts and by 1945 up to a 100 plus light AA guns (40mm/20mm). In the late war years these ships became capable of providing incredible sustained AA firepower protection to the fleet. The superb engineering plants and machinery of the USN fast battleships permitted them to operate at the cruising speeds necessary for sustained high speed carrier operations. The extensive armor and protection systems of USN battleship designs permitted them to sustain massive potential and real damage with minimal impact on their operational capabilities.

The fast battleships were also deployed with the fleet to provide protection to the fast carriers against possible unexpected surface attack (such as occurred at the Battle off Samar in Oct 1944). As the protection systems of the carriers were no match for any sort of heavy guns (i.e. cruiser or battleship fire). And during the WWII era the ability to operate aircraft effectively at night was severely limited. It is significant to note that the USN did not commit the carrier based fleets to sustained operations, (i.e. such as invasion operations, or sustained raids deep into enemy territory) until fast BB's become available in late 1942. It would seem that most USN senior officers remembered the lessons of fleet problem XX of 1936, when the carrier forces of Lexington, Saratoga, and Langley operating without battleship support, blundered into the battleline in the middle of the night. The outcome such a surface action would have likely been the loss of all three carriers. And also to the loss of the British Carrier Glorious off Norway in Jun 1940 to 11" gunfire from the German Battlecruisers Scharnhorst and Gneisenau.

It has be said that other lesser types of ships (i.e. cruiser types) could have performed functions of the fast battleships just as well, but given the smaller 'gun count' of their AA batteries they probably could not have, and it does remain that the fast battleships proved to be the 'right ships at the right time' able to provide such a high level of protection to the carrier task forces. That the USN suffered only the minimal loss of the light carrier Princeton CVL23 from 1943 onwards. By way of comparison the USN lost 3 fleet carriers prior to the arrival of the fast battleships.

17 Mar 1945 USS Iowa BB61 off Hunters Point NSY after overhaul. Note the tall pole mainmast topped with an SC2 radar. Paint is Ms22 which BB61 wore until mid 1947. Most Ms31/32 pattern battleships were repainted into Ms21/22 by early 1945. dbc

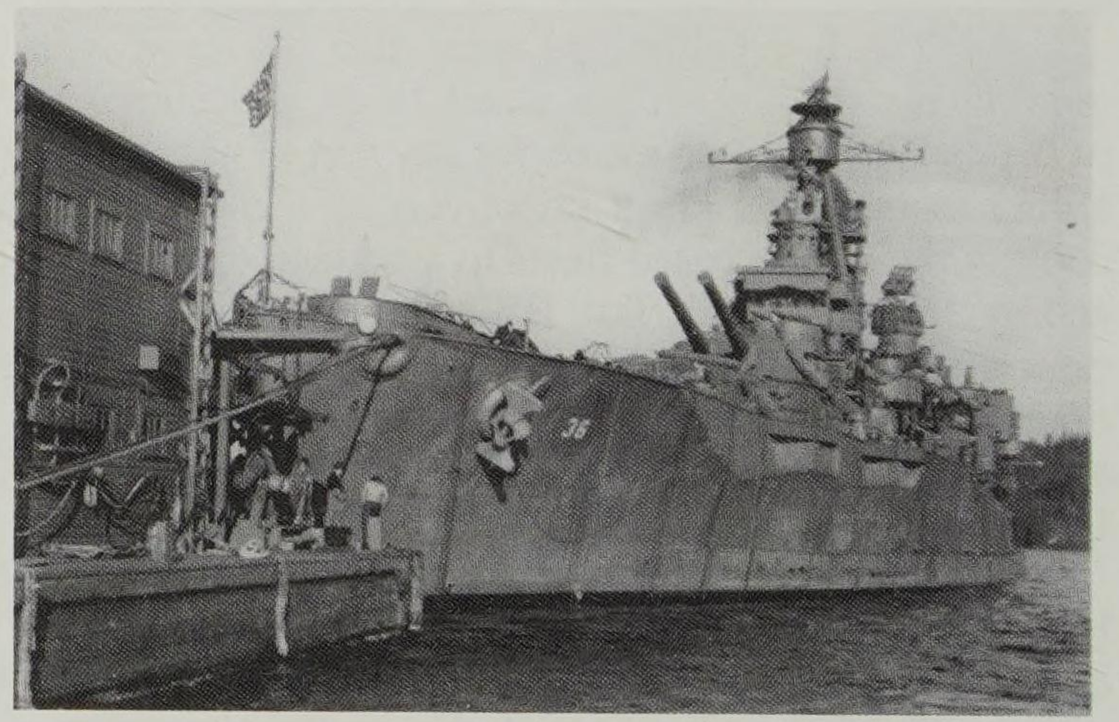


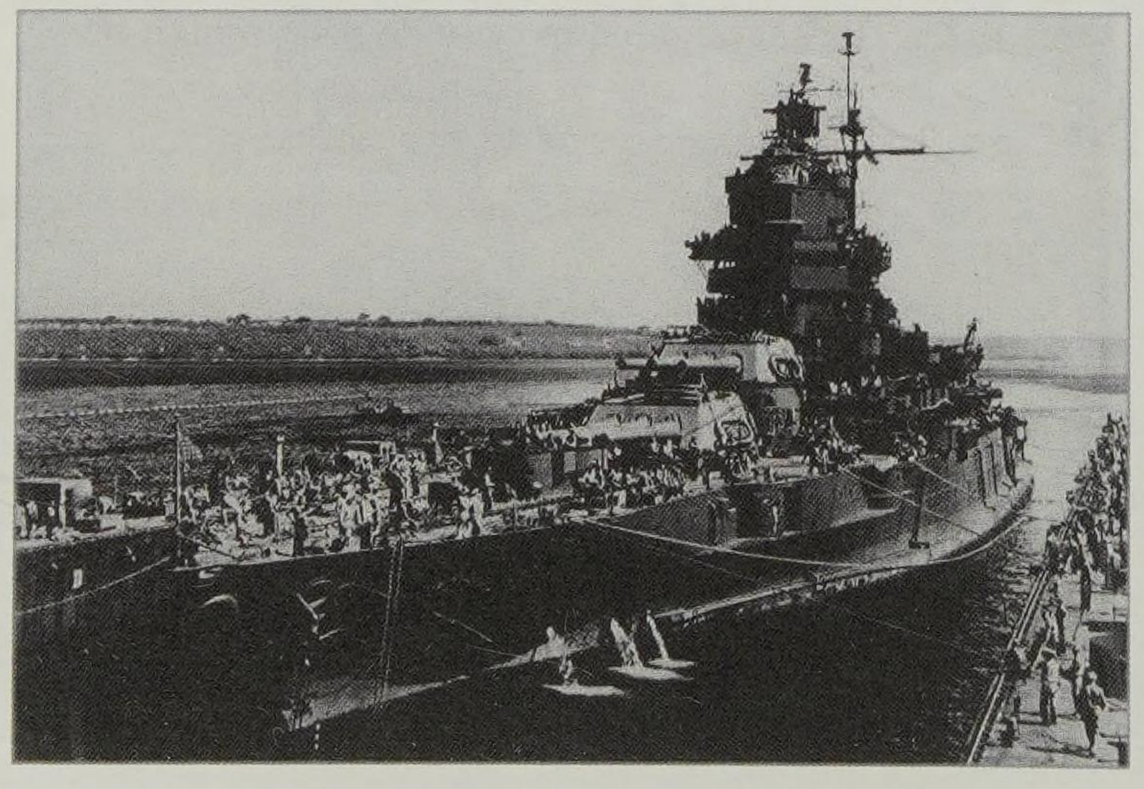
The Slow Battleships: (BB32-BB45 classes). Of the fifteen older BB's in commission in the USN in 1941, (3 1st generation and 13 2nd generation), three dated from as early as 1909/10 (BB33 BB34 BB35). With the most modern having completed in 1923 (BB48), almost twenty years prior to US involvement in WWII. Almost half the ships of the prewar battlefleet were veterans of WWI (BB33-BB39). All had been rebuilt to varying degrees of modernization during the interwar years, (BB32-BB42 extensively). With upgraded protection (antitorpedo blisters, additional horizontal armor and turret face armor for protect against bombs and plunging shell fire, vastly improved (though still wholly inadequate) anti aircraft armament, and new fire control systems, which allowed for improvements in gunnery accuracy and the effective range of the heavy guns, which also received increase in elevation from 15° to 30°.

9 Feb 1942 Puget Sound NSY USS Maryland BB46 post Pearl Harbor attack repairs. The BB's that survived the attack with minimal damage BB38 BB43 BB46 were repaired to their preattack configurations and were , with the BB45 and the BB40 class assigned to patrols of the US West Coast as protection against possible Japanese attacks (TF1). By Aug/Sep 1942 when the threat of direct attacks had diminished, these ships began cycling though modernization programs and were subsequently reassigned to support amphibious operations in the Pacific Theater.

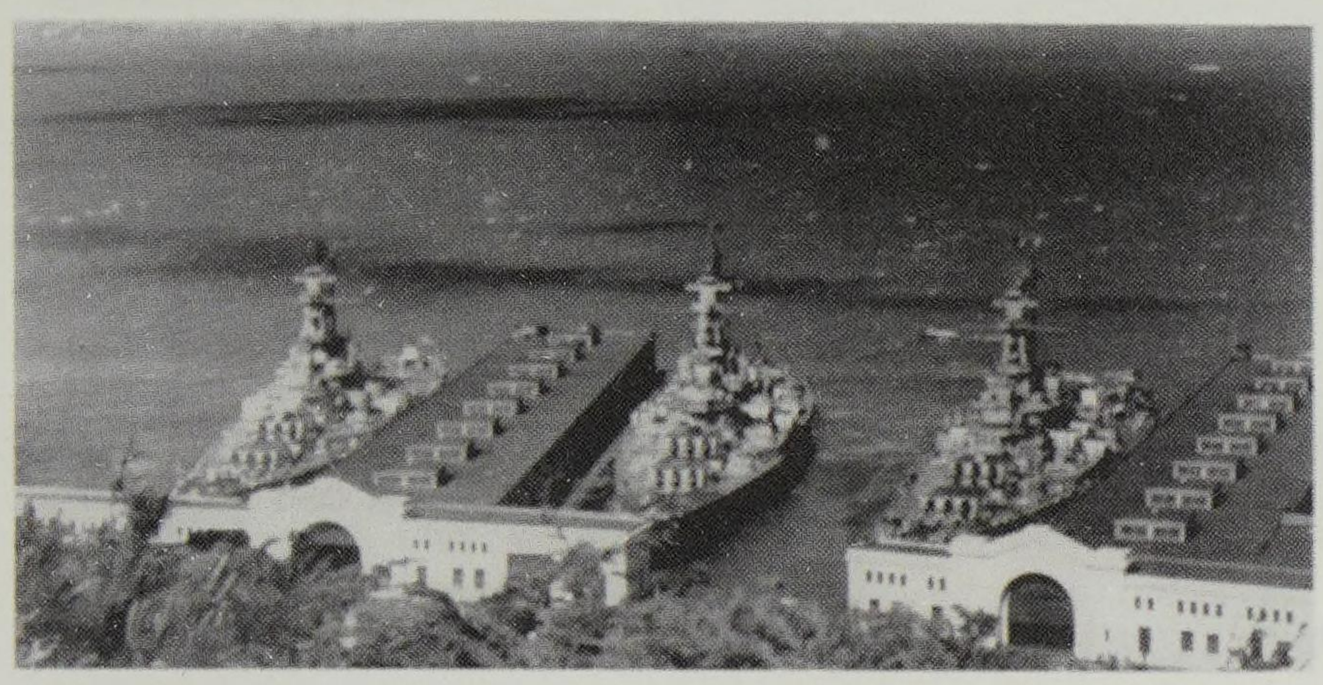
After the permanent loss of 2 battleships (Arizona and Oklahoma) at Pearl Harbor, the surviving and salvaged ships were again subject to modernization to varying degrees during the war years. Protection was again upgraded, the AA armament greatly augmented by upgrading the heavy AA replacing the prewar 5"/25 with 5"/38 DP mounts (BB36 BB38 BB42 BB43 BB44 BB46 BB48) and a large number of medium/light AA 40mm/20mm guns added. In the case of the rebuilds applied to the BB43 BB44 BB48 they were upgraded to the standards of the 3rd generation BB classes with the exception of the speed factor. The older battleships soldiered on the Atlantic and Pacific Theaters providing vital support in the form of shore bombardment, heavy escort services for newly developed amphibious fleet operations. And convoy escort protection against surface raiders, particularly in the Atlantic Theater (BB33-BB36). By the older battleships fulfilling these duties, they released the fast battleships to operate almost exclusively in support of the fast carrier task forces. By early 1945 all remaining slow USN BB's serving in the Atlantic were transferred to the Pacific Theater. In early 1945 the USN began cycling the slow BB's thru AA upgrades in anticipation of operations during the projected invasion of the Home Islands of Japan. Which were scheduled on Kyushu (Olympic) for Oct 1945 and for Feb 1946 on Honshu (Cornet).

Right: 15 Dec 1942 Puget Sound NSY. USS Nevada BB36 undergoing modernization. Note the plated over portholes, external armored belt, and the empty former casemate positions shipped aboard the BB33-BB40 class ships. BB36 reached IOC in Apr 1943 in time for the Kiska Island Alaskan operations. The modernized 2nd generation BB's provided the primarily precision heavy shore bombardment support from May 1943 onwards that proved to be so crucial during the amphibious operations in the Pacific Campaign. The ship is painted Ms14.





Left: 15 Aug 1944 ASBD1. Espirtu Santo, New Hebrides Islands. This was the first time a USN BB entered a floating drydock. Use of the ASBD's for BB's meant repairs for most light to moderate battle damage, and routine maintenance could be performed at advanced bases. In WWII the USN developed a fleet of service ships and mobile base infrastructures which enabled combatant units to remain with the fleet in the forward areas.



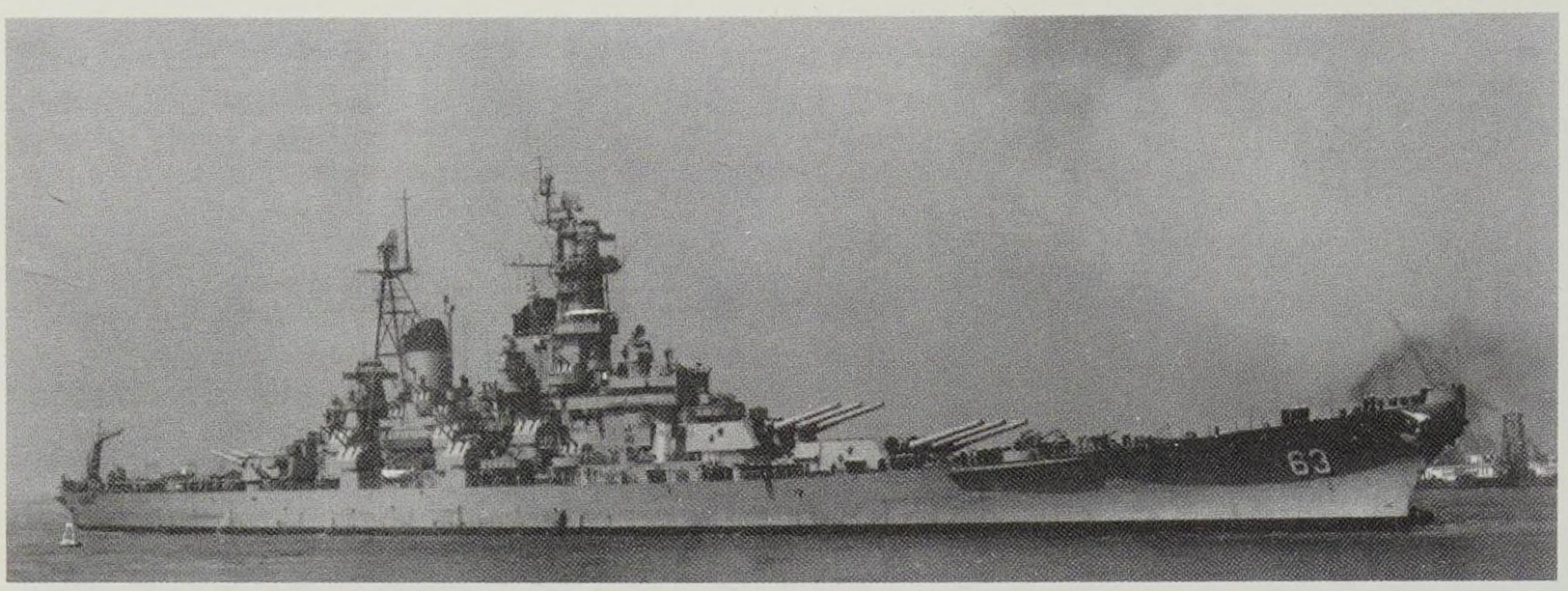
Left: 17 Mar 1946 The Embarcadero San Francisco Ca L to R USS Massachusetts BB59 USS Indiana BB58 and USS Alabama BB60. Note the SK2 radar fitted to the foremast of BB59 and BB60. While BB58 retained an SK set. All three ships are painted Ms22. USN Battleship classes BB55-BB61 remained in service and in commission 1946-1947. But they often remained idle due to insufficient manning levels. BB59 and BB60 received 1946 overalls for postwar service in ready reserve status planned for the BB57 class ships. But the program was canceled due to postwar funding reductions. The BB55 and BB57 classes had relatively short active service lives (avg 3yrs) before being placed permanently into the inactive reserve by 1947.

Postwar Era: With end of the war brought about by the deployment of USAAF B29 delivered Atomic Weapons on Hiroshima and Nagasaki. The USN proposed in October 1946 a fleet strength and composition projection that called for the retention of 20 capital ships, with the BB55 and BB61 classes in full commission and the BB40 BB43 BB45 BB57 CB1 classes in reserve, (with the BB57 class ships in 'ready reserve' status). The BB33 BB34 BB36 BB38 classes were scheduled to be disposed of immediately and subsequently, to due to funding issues, the decision to dispose of the BB40 class was taken in 1947. Due to postwar funding reductions, and the mistaken beliefs on the part of some government and military officials, that the Navy was no longer a viable major defense component. As well as theof the rise of the nuclear armed strategic bomber, and the promise of nuclear armed long range missiles soon to come. Resultantly, by 1949, only the USS Missouri BB63 remained in reduced commission as training ship.

Korean War Era: With the invasion of South Korea on 25 Jun 1950 came once more the need for heavy fire support of UN ground forces ashore. By 1952 the USN had returned the three mothballed BB61 class ships to service. But post Korean War, the aircraft carrier, submarine modernization and construction programs again led to BB funding reductions. By the mid 1950's battleship operations were, once again, no longer considered essential. By 1958 the BB61 class ships had been returned to reserve. During this reserve period the BB61 BB57 and BB55 class ships were extensively studied for conversions to other uses, but no modification programs were authorized. The battleships all remained in reserve. The 2nd generation BB43 and BB45 class battleships were disposed of by 1959. They were soon followed by the 3rd generation BB55 BB57 and CB1 classes in the early 1960's. The BB61 class survived massive disposal programs of the early 1960's remaining in reserve as fire support vessels for possible future amphibious operations. The BB61 class remained in reserve until the early 1980's when they were reactivated, modernized, and served with the fleet in the last tense years of the Cold War. With the collapse of the USSR and the end of the Cold War in 1989, all four BB61 class ships were again returned to reserve by the mid 1990's. In the mid to late 1990's the BB61 class ships were stricken from the Naval Register and loaned to various State agencies as museum ships, although they, to date (2009), remain subject to recall.

Epilogue: The age of the battleship/capital ship type lasted in the USN from 1896 to 1995. A span of time that totaled some 99 years. In the 22 years of the WWII and early Cold War era of 1941-1963, the timeline of this book. The USN deployed a total 29 capital ship types, comprised of 25 battleship types, 2 large cruisers, and 2 gunnery training ships. Between 1899 and 1940 a total of 75 capital ships were ordered by the USN. Of which 51 were completed: 49 battleships, and 2 large cruisers. Which were comprised of: 27 pre-dreadnaughts, 10 1st generation dreadnaughts, 13 2nd generation and 14 3rd generation capital ships (12 battleships and 2 large cruisers). Projected and ordered, but not completed capital ship types were comprised of: 13 2nd generation capital ship types canceled due to the Washington Naval Treaty in 1923 (7 battleships and 6 battlecruisers), and 11 3rd generation capital ship types (7 battleships 4 large cruisers), which were canceled prior to completion in 1943-50. A total 24 capital ships were ordered but canceled prior to completion (14 battleships, and 10 battlecruiser types). During WWII 3 USN capital ship types were lost (AG16 BB37 BB39) all as a result of damage received in the attack on Pearl Harbor. The only other loss of a USN battleship type was due to an internal explosion on the 2nd class BB USS Maine (ACR1) in Havana Harbor Cuba on 15 Feb 1899. Over the entire 99 year USN battleship era no USN Capital Ship was sunk by enemy action at sea.

USN Battleships (with the exception of the USS Kearsarge BB5 (1898) of the pre-WWI predreadnaught era) were named exclusively after States of the Union. The 1922 CC1 class of canceled battlecruisers were named after earlier USN warships. The 1940 the CB1 class of Large Cruisers were named after territories and possessions of the United States. USN capital ships were assigned names by Congressional Order and the name specified at the time the ships were authorized to the Navy Department for construction. Disposal of a USN Capital Ship required Congressional Approval.



Aug 1954 Norfolk NSY USS Missouri BB63 arriving from a training cruise to France and Portugal. The ship is in her final 1950's configuration, with a quad lattice mainmast topped by an AN/SPS8A height finder, the foremast is fitted with an AN/SPS6 air search and topped with an AN/SPS10 surface search. Mk25 FC radars are installed atop the Mk37 directors. The ship is painted Ms13 with black stack caps and mast tops. DPM NavAid domes are mounted on an extension on the after stack, and were fitted only to BB61 and BB63.

Capital Ships of the United States Navy 1922-1945
Indexed by Hull Number

1st Generation

BB30 Florida Class
- BB31/AG16 — Utah (S)

BB32 Wyoming Class
- BB32/AG17 — Wyoming (Sc)
- BB33 — Arkansas (T)

BB43 New York Class
- BB34 — New York (T)
- BB35 — Texas (M)

2nd Generation

BB36 Nevada Class
- BB36 — Nevada (T)
- BB37 — Oklahoma (S)

BB38 Pennsylvania Class
- BB38 — Pennsylvania (T)
- BB39 — Arizona (S)

BB40 New Mexico Class
- BB40 — New Mexico (Sc)
- BB41/AG128 — Mississippi (Sc)
- BB42 — Idaho (Sc)

BB43 Tennessee Class
- BB43 — Tennessee (Sc)
- BB44 — California (Sc)

BB45 Colorado Class
- BB45 — Colorado (Sc)
- BB46 — Maryland(Sc)
- BB47 — Washington (C/T)
- BB48 — West Virginia (Sc)

BB49 South Dakota class (C)
- BB49 — South Dakota (C)
- BB50 — Indiana (C)
- BB51 — Montana (C)
- BB52 — North Carolina (C)
- BB53 — Iowa (C)
- BB54 — Massachusetts (C)

CC1 Lexington class (C)
- CC1/CV2 — Lexington (S)
- CC2 — Constellation (C)
- CC3/CV3 — Saratoga (T)
- CC4 — Ranger (C) (ex- Lexington)
- CC5 — Constitution (C) (ex-Ranger)
- CC6 — United States (C)

3rd Generation

BB55 North Carolina class
- BB55 — North Carolina (M)
- BB56 — Washington (Sc)

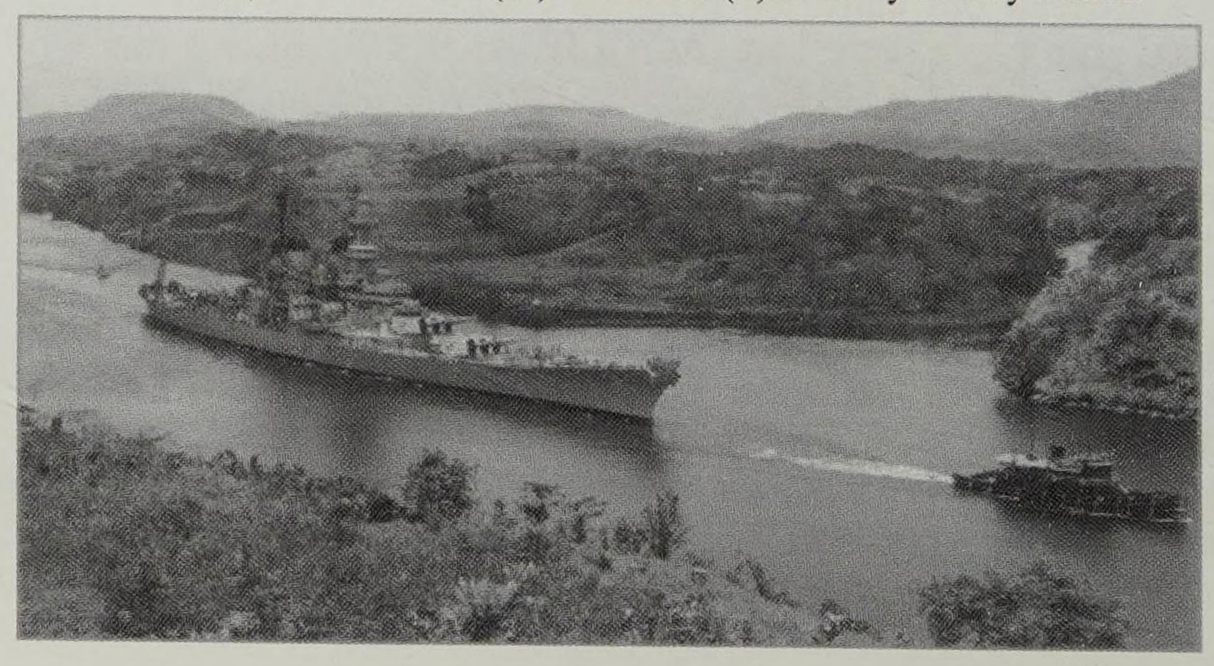
BB57 South Dakota class
- BB57 — South Dakota (Sc)
- BB58 — Indiana (Sc)
- BB59 — Massachusetts (M)
- BB60 — Alabama (M)

BB61 Iowa class
- BB61 — Iowa (R)
- BB62 — New Jersey (M)
- BB63 — Missouri (M)
- BB64 — Wisconsin (M)
- BB65 — Illinois (C/Sc)
- BB66/BBG1 — Kentucky (C/Sc)

BB67 Montana class
- BB67 — Montana (C)
- BB68 — Ohio (C)
- BB69 — Maine(C)
- BB70 — New Hampshire(C)
- BB71 — Louisiana (C)

CB1 Alaska class
- CB1 — Alaska (Sc)
- CB2 — Guam (Sc)
- CB3/CBG3/CBC3 — Hawaii (C/Sc)
- CB4 — Philippines (C)
- CB5 — Puerto Rico (C)
- CB6 — Samoa (C)

(C) Canceled (T) Sunk as Target (Sc) Scrapped
(R) Reserve Fleet (M) Memorial (S) Sunk by Enemy Action



Jul 1950 USS Missouri BB63 westbound in the Panama Canal en route to the Korean Theatre. Note that BB63 is undertow for reasons unknown. BB's usually transited the Canal under the ship's own power. However, all large ships are always towed into, thru and out of the lock basins.

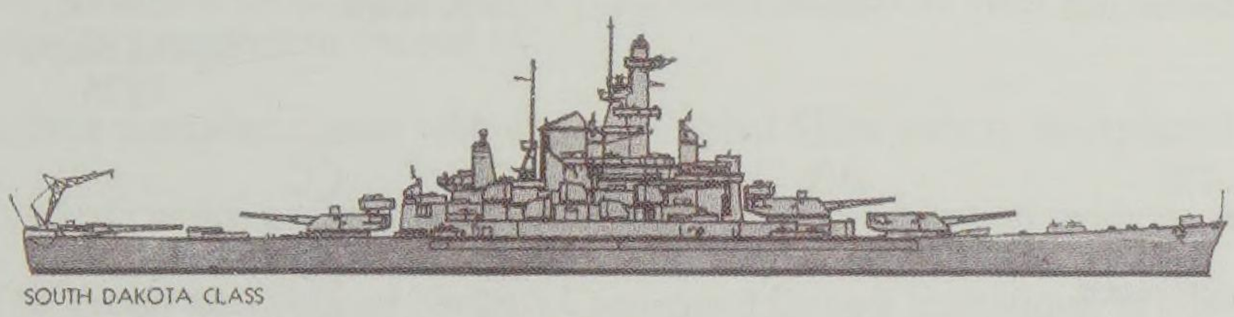
USN Battleship Recognition Silhouette Drawings

From Office of Naval Intelligence Publication USN Vessels ONI 54 Dec 1943

The accurate identification of ship types was essential during combat operations to avoid engaging friendly units, and to insure the timely engagement of hostile units. The USN periodically published updated recognition manuals, slide presentations, and silhouette sheets on all known allied and axis ship types during WWII. ONI 54 was the Dec 1943 version and ONI 222 was the Sep 1945 version. The publication Ships and Aircraft of the US Fleet by James C Fahey in the 1939, 1940, 1942, 1944, and 1945 editions were also used in USN ship type recognition.

U. S. BATTLESHIPS **ONI 54-I • RESTRICTED**

The appearance of U. S. Battleships, since the outbreak of the war, has evolved into a predominantly one-stack design. Although similar in general outline, these one-stackers may be differentiated by their armament dispositions and hull lines. Of the two stack BB's, COLORADO alone is likely to undergo radical alteration of appearance.



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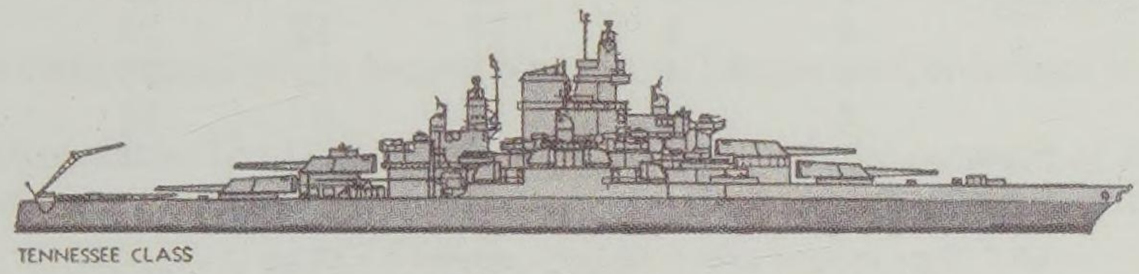
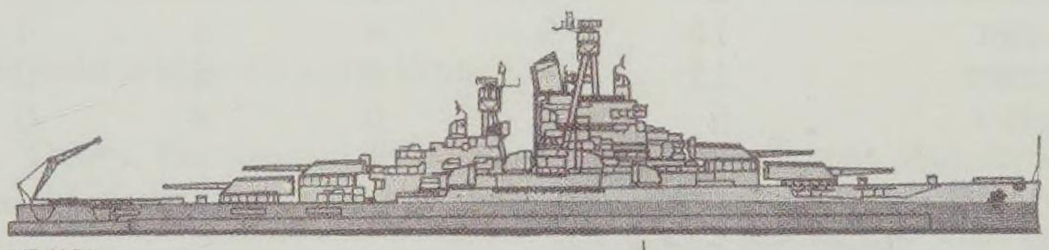


TENNESSEE CLASS



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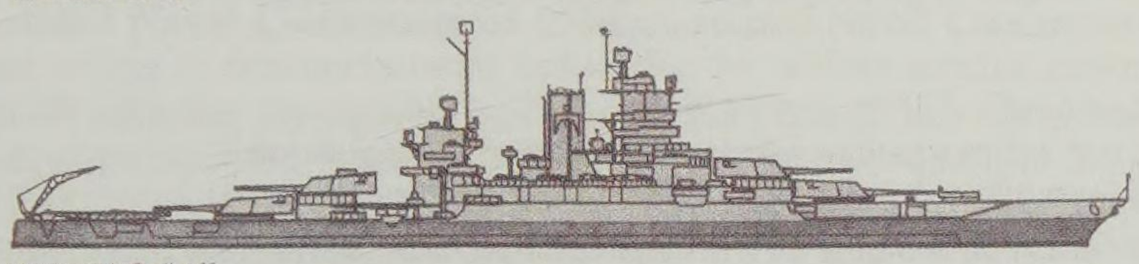
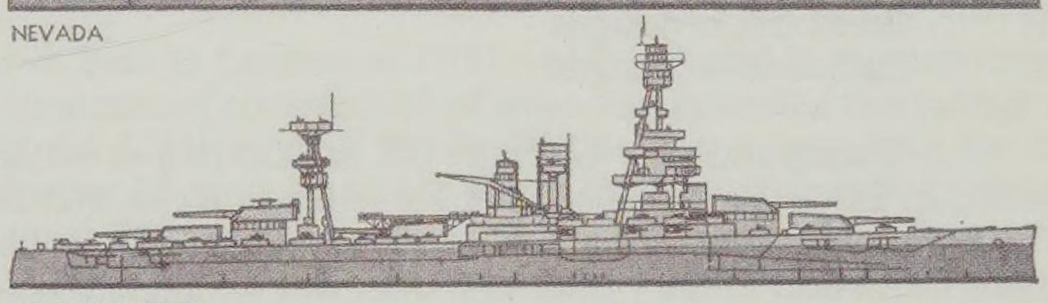
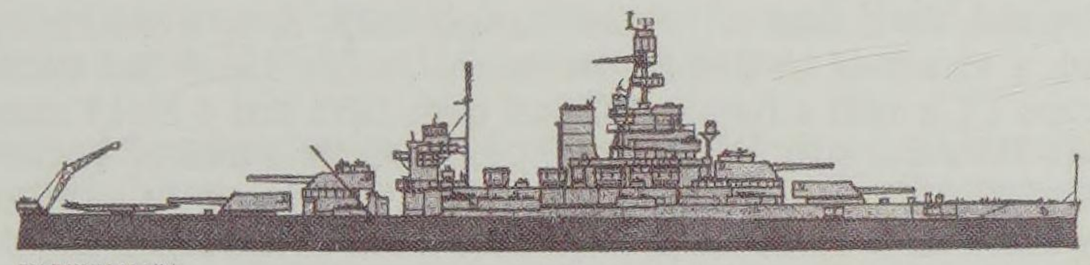


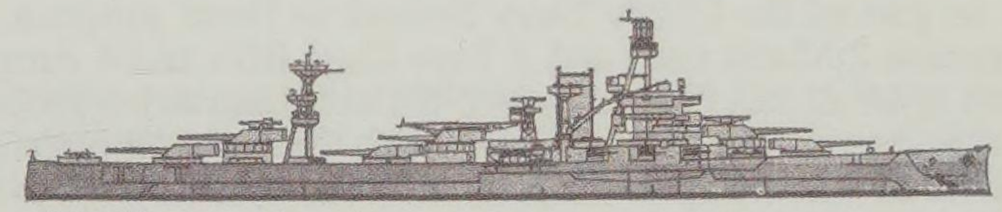
NEW MEXICO CLASS



NEW YORK CLASS

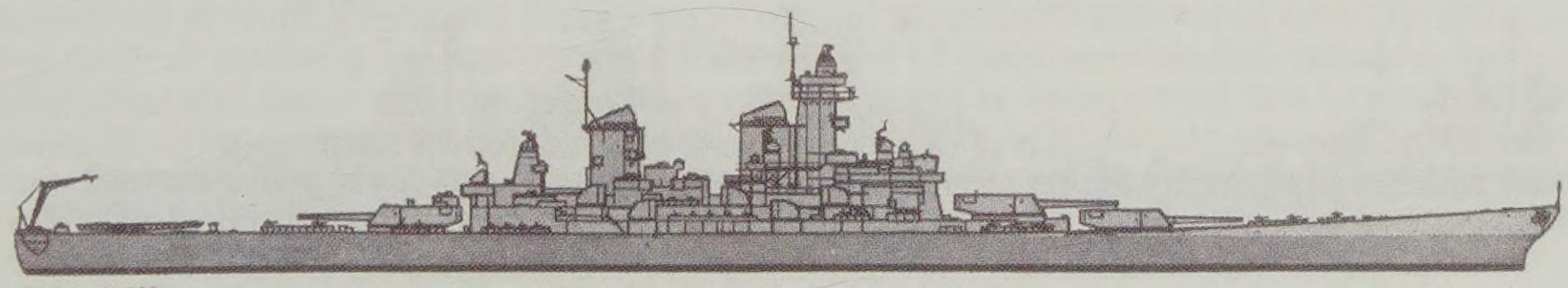


PENNSYLVANIA

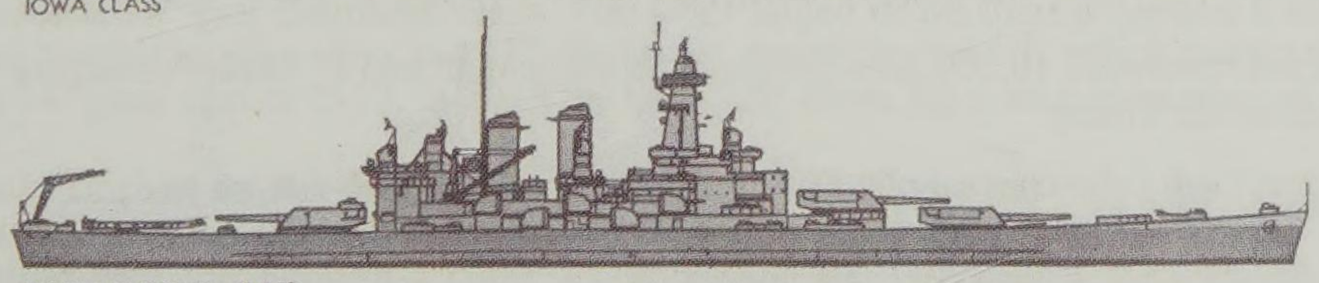


ARKANSAS

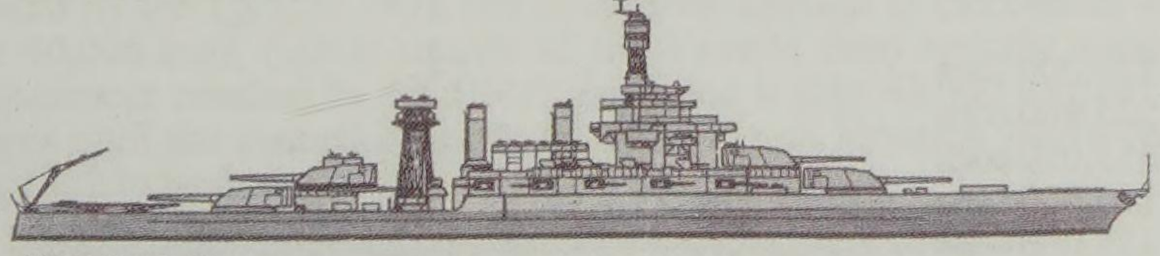
ONI 54-I • RESTRICTED Division of Naval Intelligence—Identification and Characteristics Section. 12/43 **U. S. BATTLESHIPS**



IOWA CLASS

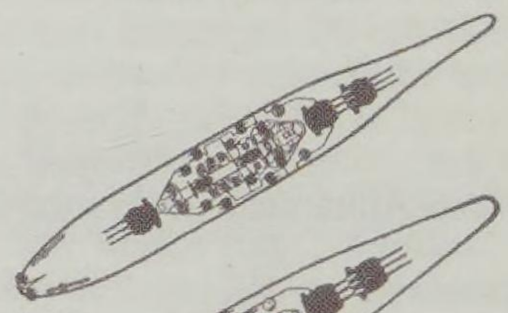


NORTH CAROLINA CLASS

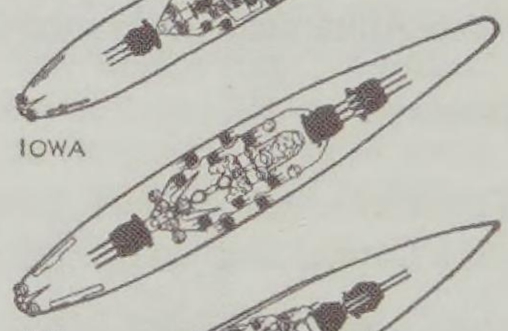


COLORADO CLASS

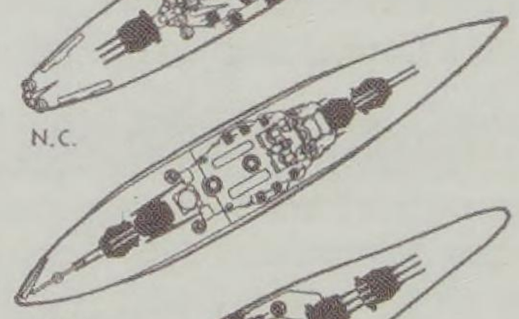
100



IOWA



N.C.



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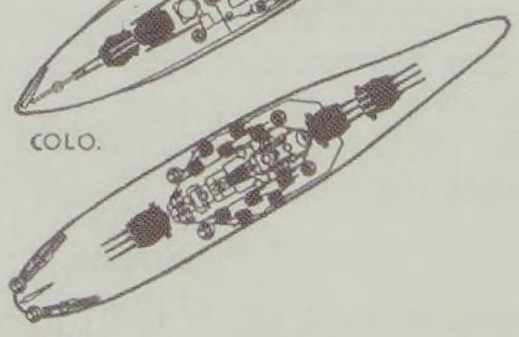
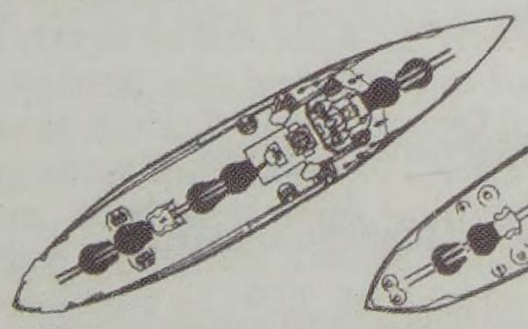


S. DAK.



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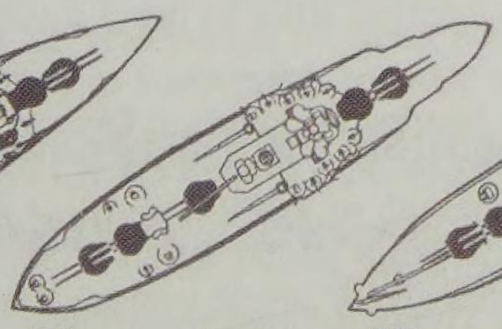

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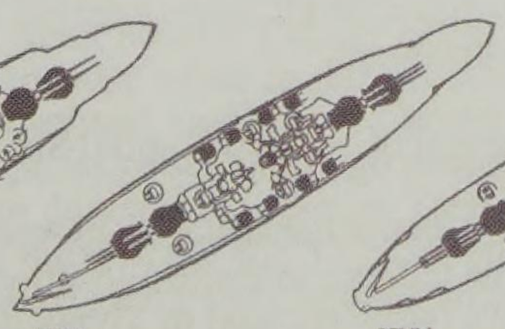

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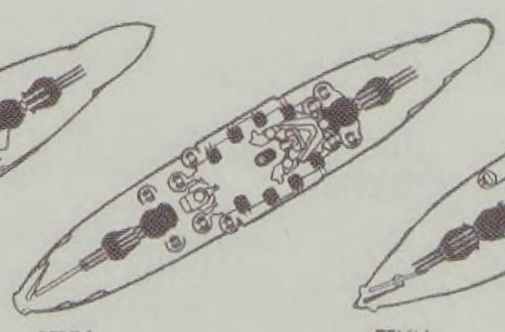

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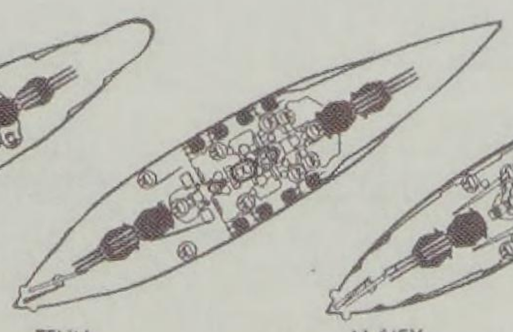

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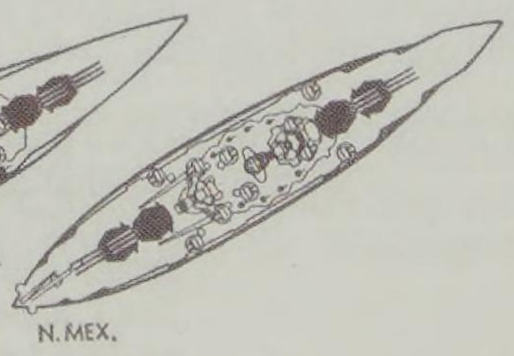


N.MEX.

Naval Armament Limitation Treaties 1921-1936
As the Treaty Applied to USN BB Design and Construction Programs

Introduction: In spite of being in possession of massive dreadnaught and predreadnaught fleets at the close of WWI. The major navies of the world had massive new Battleship and Battlecruiser construction programs underway as shown in the table below.

Capital Ship Distribution 1920

Nation	completed ships			under construction		on order		total ships		No. of Capital Ships 1925
	preBB	BB	CC	BB	CC	BB	CC	BB	CC	
Great Britain	27	35	14	0	4	4	0	39	18	57
United States	24	21	0	7	6	0	0	28	6	35
Japan	16	9	4	4	4	4	4	17	12	29
France	15	7	0	5	0	4	4	15	4	19
Italy	6	6	0	4	0	4	0	14	0	14

PreBB predreadnaught designs
BB dreadnaught designs
CC battlecruiser designs

During and after WWI the UK had the largest battlefleet in the world, and after the war had no apparent potential Naval Threats in the either the Atlantic or the Mediterranean. But the UK still had 4 Invincible G3 class CC's under construction and 4 N3 class BB's on order for a total of 8 new Capital Ships to be available by 1925. By 1921 the USN was in possession of the 2nd largest Battlefleet in the world. The USN had during and immediately preceding WWI constructed a new Battlefleet that rivaled the UK in numbers of modern ships and exceeded the latest UK designs in quality and innovation. By 1920 the USN had 4 BB45 class, 5 BB49 class BB's and 6 Lexington class CC's under construction for a total of 15 new Capital Ships to be available by 1925, as part of the USN's 'Navy Second to None' program. With a vision of an Empire across the Pacific Japan had under construction 2 Mutsu class and 2 Tosa Class BB's and 4 Amagi class CC's with a further 4 Owari class BB's and 4 No13 class CC's on order as part of a massive '8-8' fleet construction program (8 BB's and 8 CC's less than 8 years old) for a total of 16 new Capital Ships also to be available by 1925. France had 5 Normandie class BB's under construction and 4 Lyon class BB's on order for a total of 8 new Capital Ships to be ready by 1925. While Italy had 4 BB's of the Caracciolo class under construction also to complete by 1925. Thus the stage was set for another world wide Naval Arms Race. As the US and UK had no desire to participate in another Naval Arms Race like the one which had preceded and contributed so heavily to the start of WWI. And as the UK was spent financially by the enormous cost of the Naval Capital Ship race with Germany that had preceded WWI. That in 1921 the US suggested convening a Naval Arms Limitation Conference to avert new Capital Ship Arms Race in the Pacific. A race which was viewed as having the probable ultimate outcomes, of either bankrupting the nations involved, or leading to a Second World War. The UK, Japan, France, and Italy agreed in principal, and the Conference was scheduled to be held in Washington DC set to open in Nov 1921. The Washington Naval Conference as it became known resulted in the Washington Naval Armaments Limitation Treaty which was signed by the representatives of the 6 powers on 6 Feb 1922.

Terms of the Treaty:

A definition clause which specified that any ship which exceeded 10,000 tons Standard Displacement and 8" Main Armament was a Capital Ship and therefore subject to the terms of the Treaty.

A ratio of Capital Ships permitted to each nation was defined as:

Nation	Ship Ratio	Tonnage Ratio
United States	5	525,000 tons
Great Britain	5	525,000 tons
Japan	3	315,000 tons
France	1.5	175,000 tons
Italy	1.5	175,000 tons

A limitation of BB numbers clause which specified the disposal of all older existing BB's to bring a nation's total Capital Ship tonnage into compliance with the nation's Treaty tonnage allowance.

A limitation clause which ordered the cessation of, and disposal of, all new Capital Ships then under construction.
With an exclusion clause which allowed:
The USN to complete 2 BB45 class ships under construction to reach the modern tonnage allowance.
Japan to complete the Mutsu to reach the modern tonnage allocation.
The UK be permitted to construct 2 BB's (Nelson class) of Treaty defined specifications to achieve the modern tonnage allocation.

An Aircraft Carrier Conversion clause which allow 2 under construction or existing Capital Ship hulls to be converted to Aircraft Carriers whose tonnage could not exceed 33,000 tons and armament not exceed 8". USN Lexington Saratoga, Japanese Akagi Kaga. French Bearn, UK Courageous Glorious.

A reconstruction clause which defined parameters permitted in the modernization of Capital Ships. By restricting them to a less than 10% increase in displacement. Also to fitting the same caliber and gun count of armament as was fitted prior to the modernization.

A specification clause which defined the dimensions of future Capital Ship construction be limited to 35,000 tons Standard Displacement (with Standard Displacement defined as with no fuel or boiler feedwater aboard). Main Armament Gun Caliber was not permitted to exceed 16".

A time limitation clause with allowed Capital Ships only to be replaced when they exceeded 20 years of age from launching date.

A clause which prohibited no new Capital Ship construction, with the exception of the exclude ships, be started for 10 years.

The Treaty also defined Aircraft Carrier and Cruiser limitations, in addition to limitations on the fortification of Naval Bases.

A clause specifying a second Naval Arm Limitation Conference to be held within 10 years time.

Aftermath: The US and UK were pleased with the outcome of the Treaty. France and Italy were largely indifferent. But Japan was displeased as she felt she should be allowed parity with the US and UK, but reluctantly signed and complied.

London Naval Conference of 1930: A second Naval Conference was held in London in 1930 which resulted in the maximum gun caliber of armament being reduced to 14" unless another nation commenced construction of ships that exceeded this caliber at which time the permissible caliber would revert to 16". (Invoked by the USN in 1938 for the BB55 class ships). Also for the signatories to refrain from any new Capital Ship construction for a further 10 years. Included was a Training /Target Ship clause which permitted the demilitarization of 2 scheduled for disposal Capital Ships for Gunnery Training and/or Target Ship usage. (USN Utah AG16 and Wyoming AG17, Japan Hiei (restored to BB status in 1936), UK Iron Duke).

Japan announced intention to withdraw from all Naval Limitation Treaties on 29 Dec 1934 and began preliminary design work on the 4 ship 72,000 ton 18" gun armed Yamato class.

Second London Naval Conference of 1936 A second Naval Conference was convened in London in 1936 but as Japan was not present the remaining 5 signatories accomplished little other than to include a tonnage escalator clause at the request of the USN to permit tonnage to increase to 45,000 ton if other nations started construction of ships in excess of 40,000 tons. By 1936 the inevitability of WWII was becoming apparent.

Treaty Capital Ship Compliance With the appearance of the 1st of 6 projected German Panzerschiff design of 1932 ('Deutschland class' 10,000 tons (13,000 tons actual) 11" guns) permitted under the terms of the Treaty of Versailles had such an impact on the World's Navy Departments. So that by 1934 France and Italy had both laid down new designs of capital ships both of which exceeded the Treaty specified displacement. By 1937 there were 21 new Capital Ships under construction in the world's Navies. First to be started were the 2 Battlecruisers of the French Dunkerque class 26,000ton 13"of 1934 started as 'replies' to the German Panzershiffen. Next was the 4 ship Italian Littorio class at 41,000 tons 15" guns announced in May 1934. Followed in 1935, by the 4 ship French Richelieu class of 35,600tons with 15" guns, intended to counter the new Italian ships. Germany, which was not a signatory to the Treaty, but regulated by the Versailles Treaty of 1920, started construction in 1936 on the 2 ship 42,400ton 15" gun Bismarck class. The USN laided down their projected 6 ship 41,000 ton 14" gun (upgraded in 1938 to 16 " guns) North Carolina class in 1937. Followed shortly by the UK which started their 5 ship King George the V class of 36,800tons with 14'"guns also in 1937. In 1938 the USN laid down the 6 ship Iowa class of 48,000tons with 16" guns.

Treaty Impact on BB design: While all the world's Navies exceeded the Treaty limitations in their initial and subsequent Capital Ship designs. All the nations involved, with the exception of Japan, made a serious effort to attempt to comply as closely as possible with the Treaty's 35,000 ton limitation and gun caliber stipulations. The tonnage escalator clause of the Treaty was invoked by the USN in 1938 which allowed tonnage to increase to 45,000 tons if other nations (Japan) were constructing ships over 40,000 tons, (initial reports of the Yamato class specific a ship of 42,000 tons armed with 16" guns). This increase in displacement resulted in the USN's projected 6 ship 48,000 ton 16" gun BB61 class of 1939. The Treaty restricted USN BB designs until the cancelled 5 ship 65,000 16" gun Montana BB67 class of 1940. The BB67's were the only class of USN BB's after 1922 to be designed free of Treaty limitations.

Conclusions: The Treaty had far reaching impact on the design of Capital Ships from the 1920's thru 1940. It did serve to avert the Capital Ship race that was well underway by 1921, with the attendant reduction of Naval Armaments construction costs. It also served to provide a 12 year period of when no new Capital Ships were constructed (the so called 'Battleship Holiday'). The Treaty must also be viewed as successful, because while in did not ultimately deter the Second World War, it did delay it by 15 years or more. It also tempered the size, power and numbers of Capital Ships built prior to WWII. It also inadvertently helped to bring about the demise of the Battleship type by providing large powerful Aircraft Carriers to both the USN and Japan. Both of whom used these ships to in the 1930's to develop the Carrier Tactics which led to the displacement of the Capital Ship and Surface Battlefleet Tactics. Tactics which dated from the 15th century. With this unintended assistance from the Washington Naval Treaty of 1922, 20th century Naval Warfare by 1941 had become primarily carrier borne.

Chronology of the World War II and the Early Cold War Era 1939-1963
(With emphasis on USN Battleship Operations)

1 Sep 1939: **Start of WWII** Germany invades Poland, Britain and France declare war. *5 Sep 1939* US declares Neutrality. US Battleship Force stationed at San Pedro CA is comprised of 15 slow battleships from 1909-1923 (BB33–46 BB48). And 2 ex-Battleships converted to Gunnery Ships (AG16 AG17). 8 Fast Battleships are under construction (BB55-BB62).

20 May 1940: **"Two Ocean Navy"** act passed. 1,325,000 tons of new warship construction authorized. (BB65-71 and CB1-6 authorized). Decision made to "Forward Deploy" US Battlefleet at Pearl Harbor HI to deter Japanese aggression in the Far East.

2 Sep 1940: **Destroyer Sale to UK** 50 WWI era, 3 **Caldwell** 47 **Wickes** class 4 stack destroyers transferred to UK for leases of bases on six British Caribbean Colonies.

5 Sep 1940 **Neutrality Patrols** USN commences air and surface "Neutrality Patrols" (TF1) to observe and report on foreign (German) naval activities in the Western North Atlantic. (BB33 BB34 BB35 BB40 BB41 BB42).

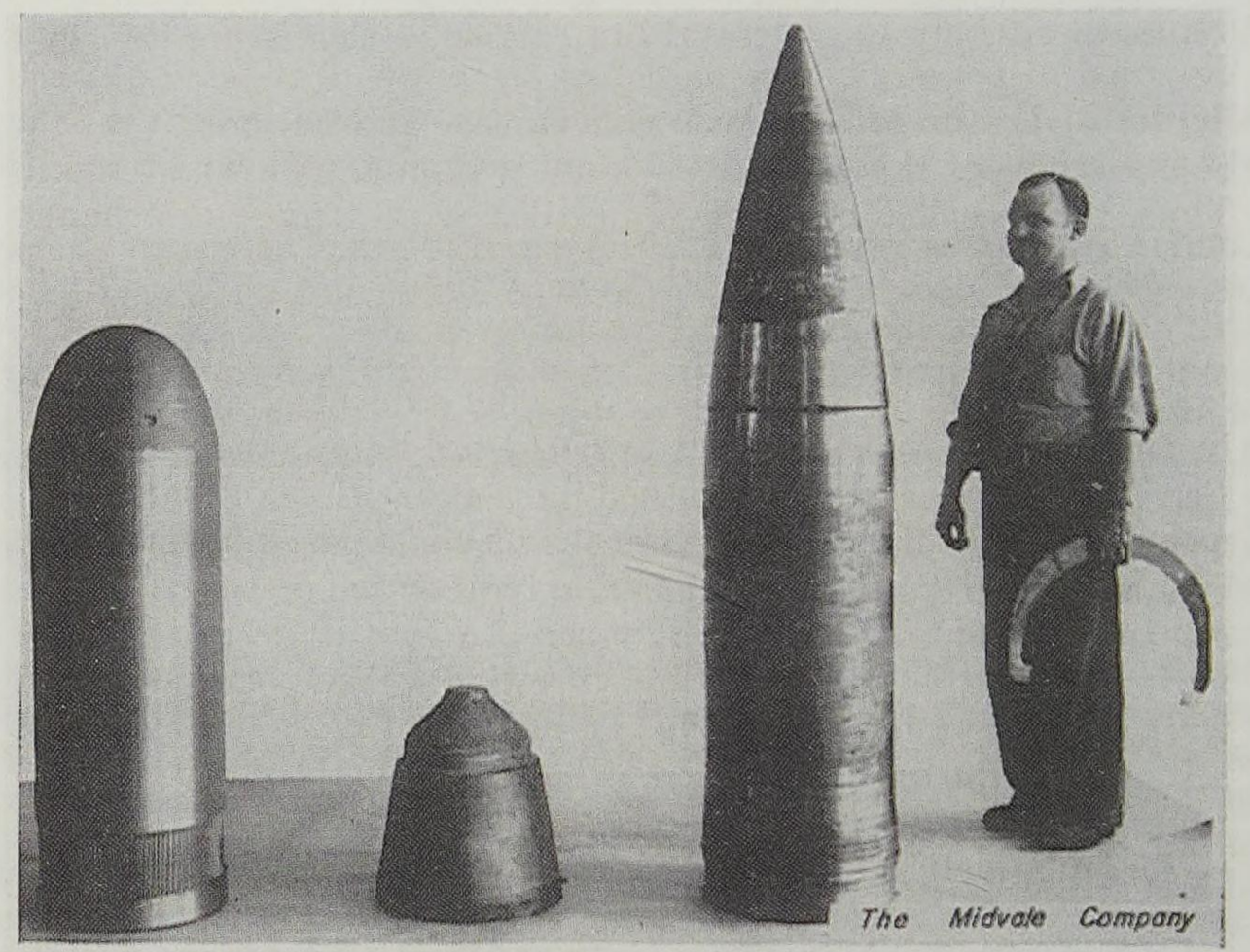
9 Sep 1940 **Two Ocean Navy Act** capital ships BB65-BB71 CB1-6 ordered.

22 Sep 1940 Japan occupies French Indo-China. Forward Naval bases become available to Japanese Navy. War with China, started in 1937, continues unabated. Japan increases tempo of war preparations.

11 Mar 1940 **Lend Lease Act** passed which permits British and Allied Powers to procure US Military Hardware. *30 Mar 1941* **US Seizes Axis ships** interned in the US ports. *9 Apr 1941* US occupies **Greenland.** *7 Jul 1941* US occupies **Iceland**.

25 Jul 1940 **US Embargoes Oil** and strategic materials exports to Japan. Japan is left with enough oil reserves for 2 years of peacetime use, or for 6 months of war operations. *6 Sep 1941* Decision to go to war to obtain oil reserves in the Dutch East Indies is made by Japan.

11 Nov 1940 **Taranto Raid. HMS Illustrious** launches an airborne torpedo night attack with 21 aircraft on 6 Italian battleships at anchor and sinks 1 3rd generation and 2 extensively modernized 2nd generation BB's. 1 of the 2nd generation BB's is not repaired.



An assembled 16-inch projectile standing beside a body and cap. Addition of a windshield made the 2700-pound weapon taller than the man with calipers.

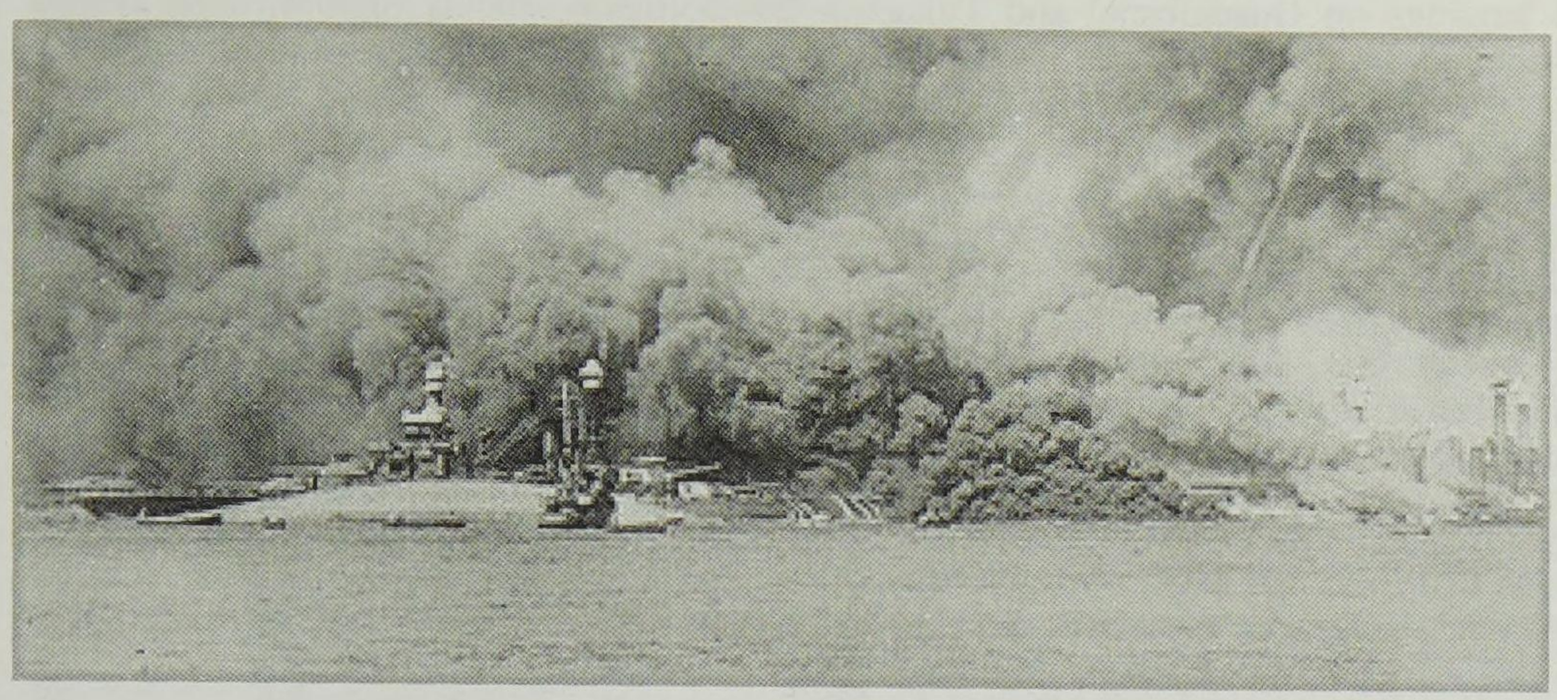
9 Apr 1941 **USS North Carolina** first of 10 new design fast 3rd generation battleships completed by USN in WWII is commissioned. Due Washington Treaty stipulations of 1922 BB55 is first new USN battleship in 19 years.

10 Apr 1941 **First combat** by USN forces in WWII in North Atlantic against German U-boats while USN forces are engaged in escorting British Convoys in the declared war zone. Unsuccessful U-boat attack against **USS Niblack** DD424. *7 Jul 40* US troops occupy Iceland (BB40 BB41 BB42). *4 Sep 40* **USS Greer** DD145 unsuccessfully attacked by U-boat. *17 Oct 40* **USS Kearny** DD432 damaged by torpedo attack. *31 Oct 40* **USS Rueben James** DD245 sunk first USN ship loss in WWII.

24 May 1941 **Battle of the Denmark Strait** Battlecruiser **HMS Hood** sunk by German BB **Bismarck** off Iceland. **Hood**'s main magazines detonated after 2-3 8"shells from heavy cruiser **Prinz Eugen** and a possible single 15"shell from **Bismarck.**

27 May 1941 **State of Emergency.** President Roosevelt declares a national "state of emergency" in response to German military actions in the North Atlantic. After damage from carrier torpedo aircraft German BB **Bismarck** sunk by UK BB's HMS **Rodney** and HMS **King George V**.

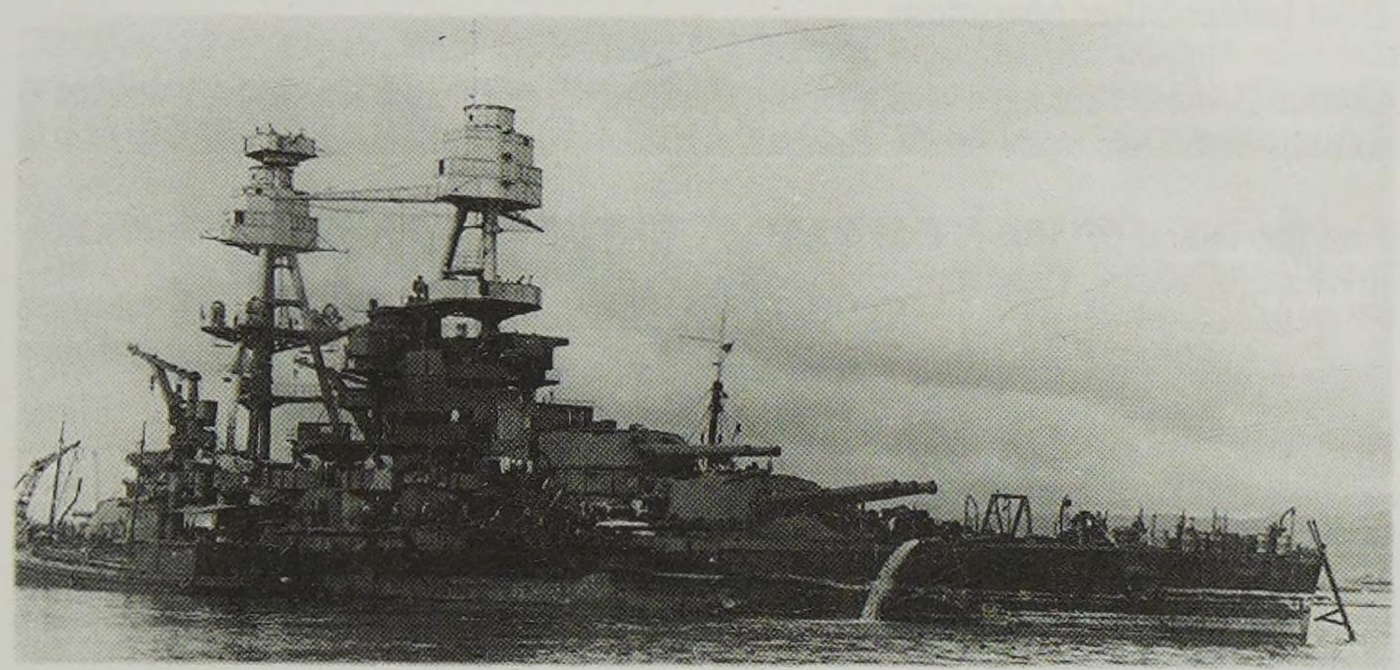
7 Dec 1941 **United States enters WWII**. The USN Battlefleet at Pearl Harbor, and US bases on Oahu attacked by Japanese carrier planes. Heavy damage to US Battleship Force (2 BB's lost, 2 BB's severely damaged, 4 BB's lightly damaged) (+AG16 *BB36 +BB37 *BB38 +BB39 *BB43 **BB44 *BB46 **BB48).(+ Sunk * light/med damage ** sunk, raised, modernized and returned to active service). US battlefleet strength reduced to 9 slow battleships (3 of WWI vintage) (BB33 BB34 BB35 BB40 BB41 BB42 BB45) and 2 fast battleships (BB55 BB56) which are unavailable for immediate action due to incomplete training. Japanese forces commence victorious sweep across the Pacific: *8 Dec 1941* Japanese forces land on the Philippines, Guam, and Malaya. *10 Dec 1941* British 3rd generation battleship HMS **Prince of Wales** and 2nd generation battlecruiser HMS **Repulse** sunk by Japanese land based aircraft off Malaya. *23 Dec 1941* Wake Island invaded and captured. *25 Dec 1941* Japanese forces land at British colony of Hong Kong. *2 Jan 1942* Manila surrenders. *15 Feb 1942* Singapore surrenders.



7 Dec 1941 Pearl Harbor Hawaii. approximately 1100L. USS Maryland BB46, with the upturned hull of the capsized USS Oklahoma BB37 in the foreground. In the background smoke from the burning USS West Virginia BB48 and USS Arizona BB39 obscures the sky. The Pearl Harbor attack reduced the Pacific battleline to 1 operational battleship, BB45 under refit at Puget Sound NSY, and 3 lightly damaged though operational BB'S,BB38 BB43 and BB46. BB38 was in drydock at the time of the attack, BB43 and BB46 were moored inboard of the severely damaged outboard BB37 and BB48. BB36 BB44 and BB48 would be salvaged, repaired and returned to service. AG16 BB37 BB39 were total losses.

1 Jan 1942 Japanese forces land on Borneo. *27 Feb 1942* Combined American-British-Dutch-Australian (ABDA) cruiser/destroyer forces attempting to attack landing beaches are defeated with loss of 2 cruisers and 3 destroyers by Japanese forces at the **Battle of the Java Sea**. Japanese forces pursue surviving allied ships inflicting further losses of 3 allied cruisers, and 2 destroyers south of Java.

19 Feb 1942 Japanese carrier forces raid Port Darwin Australia marking the southernmost limit of Japanese military operations during WWII. *9 Apr 1942* US and Philippine forces on Bataan surrender. *6 May 1942* Corregidor Island in Manila Bay is captured, ending US presence in the Philippines until Oct 1944.



17 Feb 1942 Pearl Harbor Channel USS Nevada BB36 under salvage. BB36 was the first salvaged and modernized BB to return to service, reaching IOC in May 1943.

31 Jan 1942-Jun 1942 **West Coast Patrols.** Task Force 1 (BB40 BB41 BB42) transferred from Atlantic and repaired battleships from Pearl Harbor (BB38 BB43 BB45 BB46) conduct security patrols and escort convoys along the West Coast of US and to and from the Hawaiian Islands.

18 Mar 1942 USN task force commences joint operations with British Home Fleet **USS Washington** (TF39 BB56) escorts convoys from UK to Murmansk in the USSR.

Mar 1942 **USS Wasp** (CV7) makes two ferrying operations of RAF aircraft to Malta.

5 Apr 1942 Japanese carrier force (4 CV's) attacks the British Colony of Ceylon in the Indian Ocean marking the westernmost limit of operations of the Japanese Navy in WWII. UK carrier HMS **Hermes** and two cruisers are sunk.

18 Apr 1942 **"Doolittle Raid"**. USN Carriers **USS Hornet** (CV8) accompanied by **USS Enterprise** (CV6) (TF16) with cruiser/destroyer screening force launch 25 Army B25 medium bombers against targets in Japan. First US strike against the Japanese Home Islands.

4-8 May 1942 **Battle of the Coral Sea.** First Naval Battle fought by aircraft where the opposing fleets did not sight one another. USN Carrier force of 2 fleet carriers engages Japanese Carrier force of 2 fleet carriers and 1 light carrier northeast of Australia. US loses Fleet Carrier **USS Lexington** (CV2) and Fleet Carrier **USS Yorktown** (CV5) is heavily damaged. Japan loses light carrier **Shoho,** Fleet carriers **Zuikaku** and **Shokaku** are damaged thus unavailable for the Midway operation. Battle halts Japanese southern expansion toward Australia. No USN BB's participate.

4-6 Jun 1942 **Battle of Midway.** Japanese carrier striking force of 4 CV's tasked with striking and neutralizing Midway Island prior to planned invasion is engaged by USN Task Force comprise of 3 CV's (TF16/TF17 CV6 CV8 CV5). All 4 Japanese carriers are sunk (**Akagi, Kaga, Hiryu,** and **Soyru)** many experienced Japanese pilots are lost. Japan's Carrier forces are never able fully recover losses. Future Japanese naval operations become primarily defensive. USN fleet carrier **USS Yorktown** (CV5), damaged at Coral Sea is lost. Concurrent diversionary attack by Japanese carrier force on Dutch Harbor Alaska, Attu and Kiska Islands in the Aleutians are captured. TF1-BB38 BB40 BB41 BB42 BB43 BB45,BB46 operate off NE Oahu to act as a reserve force if Japanese should defeat US Carrier Forces, and to protect West Coast of US Mainland from attack. These operations mark the northern and westernmost limits by the Japanese in WWII.

7 Aug 1942 **Operation Watchtower** US landings on Guadalcanal and Tulagi in the Solomon Islands Supported by (BB55 TF61.2), are the first USN offensive operations in the Pacific Theatre. A series of surface actions begins in the Solomon Islands area as the Japanese Navy attempts to contest the landings. Major actions comprised of: *9 Aug 42* **Battle of Savo Island.** surprise night attack of Allied beachhead support cruiser force by Japanese cruiser force, 3 US heavy cruisers and 1 Australian cruiser are sunk, 1 USN heavy cruiser is heavily damaged. *24 Aug 1942* **Battle of the Eastern Solomon's** (BB55) Japanese carrier force attempts to attack Guadalcanal USN Carrier force sinks Japanese light carrier **Ryujo.** *15 Sep 1942* Japanese submarine I19 sinks fleet carrier **USS Wasp** (CV7) and escorting DD, and damages (BB55). *26 Oct 1942* **Battle of Santa Cruz.** (BB57) Japanese carrier forces attempt neutralize USN carrier groups operating in the Solomons. USN loses fleet carrier **USS Hornet** (CV8) leaving **USS Enterprise** (CV6) as the only operational USN Fleet Carrier. **USS South Dakota** downs 26 Japanese aircraft with new 40mm AA battery. *12-15 Nov 1942* **Battles of Guadalcanal.** A series of night surface actions fought in the waters around Guadalcanal. These actions constitute one of the pivotal points of WWII in the Pacific. *13 Nov 1942* Japanese BB **Hiei** lost to USMC aircraft after sustaining damage in night cruiser/destroyer surface action. *15 Nov 1942* Japanese BB **Kirishima** lost to gunfire of **USS Washington** (TF64 BB56 BB57), **USS South Dakota** receives heavy superficial damage from Japanese battleship and cruiser gunfire. These actions mark the last major Japanese attempt to repel US forces on Guadalcanal. (carrier support TF38 BB55 BB56 BB57). Japanese actions become essentially defense and consist primarily of attempting to resupply ground forces by nightly runs of destroyers from Bougainville ('Tokyo Express').

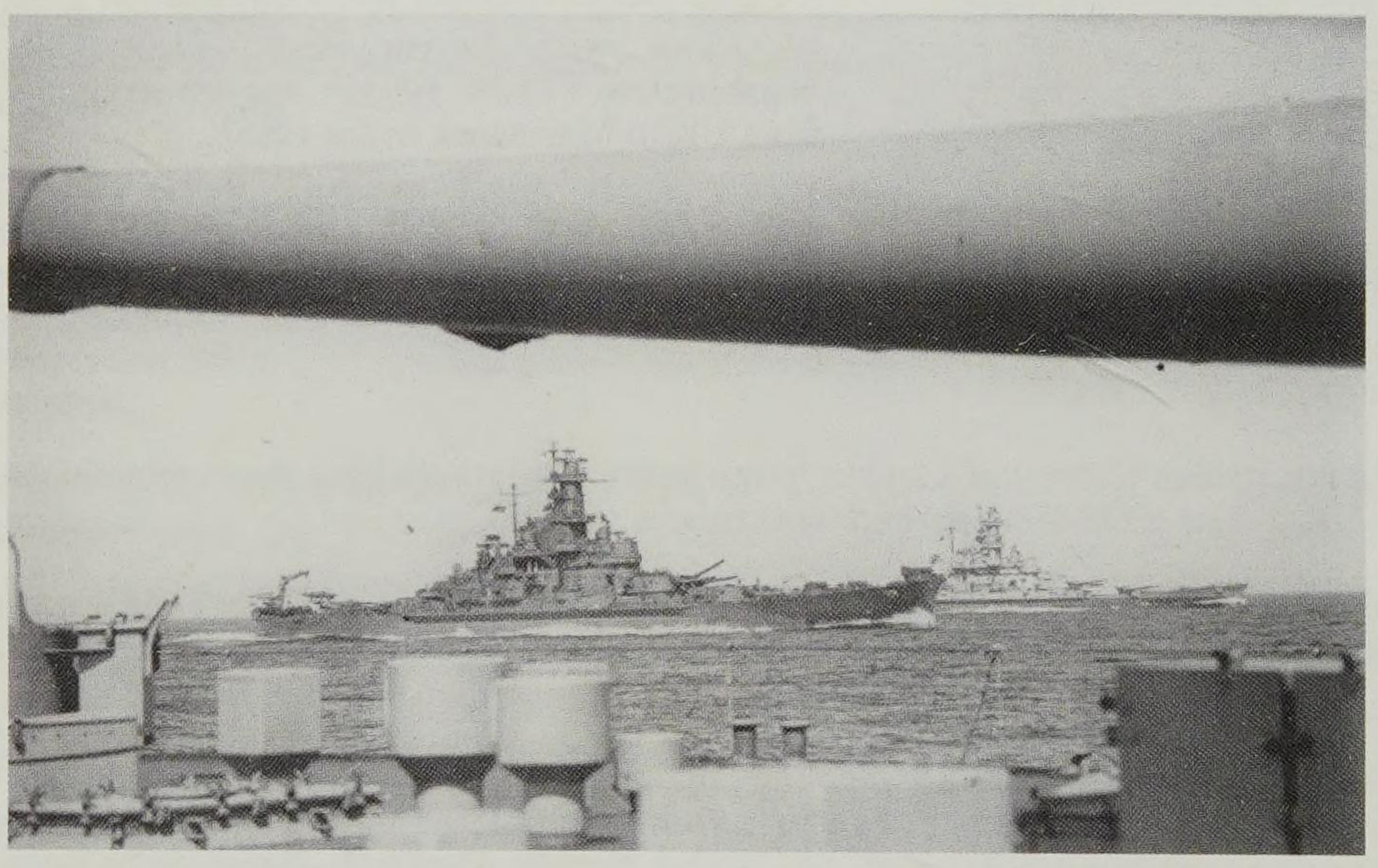
6 Nov 1942 **Operation Torch.** Allied US/UK landings in Morocco, and Algeria on North African Coast (TF34). At Casablanca battleship **USS Massachusetts** (BB59) exchanges large caliber gunfire with, and neutralizes the incomplete and immobile French battleship **Jean Bart.** (BB59) with other USN units sink 2 French destroyers. (BB34 BB35 BB36 BB59 UK BB **Duke of York**).

2 Mar 1943 **Battle of the Bismarck Sea.** USAAF and RAAF aircraft sink 8 Japanese transports carrying troop reinforcements to New Guinea. Skip bombing tactics employed for the first time in combat.

5 Mar 1943 **Atlantic Theatre**. USN Anti Submarine Warfare Groups (ASW) comprised of escort carriers (CVE) and surface escort ships (DE/DD types) commence offensive U-Boat hunter-killer operations.

26 Mar 1943 **Battle of the Komandorski Islands Alaska** US and Japanese cruisers and destroyers exchange fire in bad weather, while battle results are inconclusive, Japanese naval forces withdraw from the Northern Pacific.

11 May 1943 **Operation Landcrab.** US forces land on the Island of Attu (TG51.1 BB36 BB38 BB43). *15 Aug 1943* **Operation Cottage.** US and Canadian forces land unopposed on Island of Kiska. (fire support group TG 16.17 BB38 BB41 BB42).



Jun-Aug 1943 (BB57 BB60) operate with British Home Fleet out of Scapa Flow Scotland.

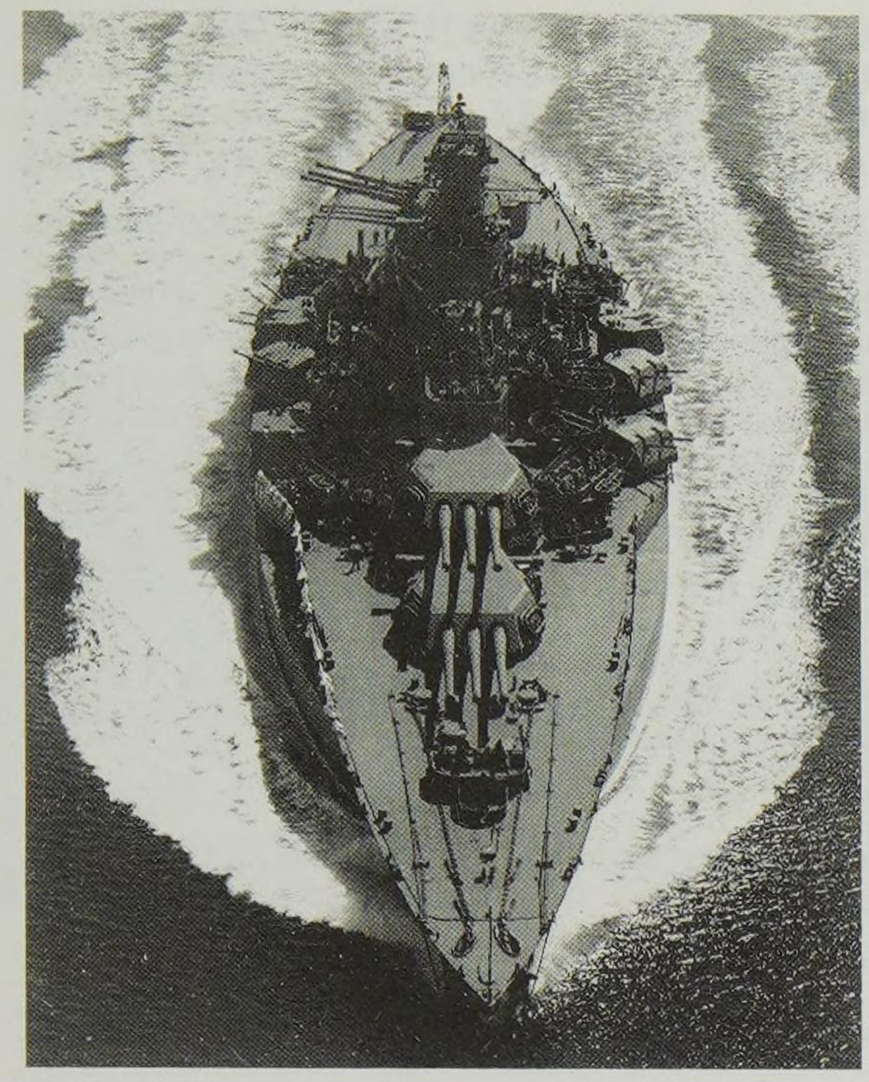
Left: Jul 1943 North Atlantic. BB57 and BB60 operating in support of British Operation Governor, a failed attempt to bring the German BB Tirpitz out of hiding in the fjords and into action. USN fast BB operations in the Atlantic were opposed by the CNO and Naval Staff who felt the Royal Navy with 23 battleship types, including four modern 3rd generation battleships, and seven supporting CV types, should be capable of countering a sortie by a single German BB, the Tirpitz and/or a CB, the Scharnhorst should they have chosen to sail. Atlantic operations by BB56 BB57 BB60 and BB61 were ordered by President Roosevelt at the request of the British Prime Minister. The USN's BB57 class compared favorably with the German Bismarck Class.

8 Jun 1943 Japanese BB **Mutsu** destroyed by magazine explosion in Hiroshima Bay.

24 Jun 1943 Construction of the last 3 (never laid down) Alaska class battlecruisers (CB4-6) cancelled. Materials diverted to construction of 4 **Des Moines** Class Heavy Cruisers (CA134 CA139 CA140 CA148).

7 Jul 1943 Construction of 5 ship (never laid down) **Montana** class (BB67-71) cancelled. Materials and construction drydock space diverted to the construction of the 3 **Midway** Class Large Fleet Carriers (CVB41 CVB42 CVB43).

30 Jun 1943 **Operation Toenails.** US forces land on Rendova and in **Operation Cartwheel** on New Georgia driving northward up the Solomons Chain. (TF36.3 BB55 BB57 BB58). *6 Jul 1943* **Battle of Kula Gulf** Japanese naval forces defeated in attempted beachhead counterattack with the loss of 1 USN cruiser. *13 Jul 1943* **Battle of Kloombangara** Japanese forces defeated again in second attempted counterattack. 3 Allied cruisers damaged. *6 Aug 1943* **Battle of Vella Gulf**. 9 Japanese destroyers loaded with troops attempting to reinforce Munda airfield on New Georgia Island are intercepted by USN destroyer force in night action, 3 Japanese destroyers sunk.



Left: May 1943 Puget Sound. BB43 at speed (20.5kns). Note the hull torpedo bulges and original hull line. The rebuilt BB43 BB44 and BB48 mounted the most advance radars and fire control systems. The BB43 BB44 and BB48 were the only rebuilt ships equipped with MkIA Fire Control Electro Mechanical Computer (Rangekeeper) as was fitted in USN 3rd generation designs. The MkIA greatly increased the accuracy of the main and secondary batteries, and gave the ships a highly effective 'blind/night fire' capability. Which proved itself in combat at the night Battle of Surigao Strait on 25 Oct 1945. During which BB43 BB44 and BB48 scored the bulk of the hits that sank the Japanese BB's Fuso and Yamashiro.

10 Jul 1943 **Operation Husky.** Allies forces land on Sicily (UK BB's **King George V Howe**). *3 Sep 1943* Italy surrenders. Italian 3rd generation BB **Roma** attacked and sunk by German Do217K's with 2 unpowered FritzX guided bombs. 4 surviving Italian BB's interned at the Great Bitter Lake in Egypt for the duration of WWII. *9 Sep 1943* **Operation Avalanche.** Allied landings in Italy at Salerno 4 UK BB's **Nelson Rodney Warspite Valiant** in support. No USN BB's in support.

1 Nov 1943 **Battle of Empress Augusta Bay.** US landings on Bougainville the northern most island in the Solomons Chain. Japanese forces attempt to attack beachhead in night action. Japan loses 2 heavy, 2 light cruisers, and 6 destroyers. One US destroyer is heavily damaged. Last battle of the Solomons Campaign.

20 Nov 1943 **Operation Galvanic.** US forces land on the islands of Makin and Tarawa in the Gilbert Islands. First major amphibious operations in the "island hopping" campaign across the Central Pacific towards Japan. (fire support group TG52.2-BB38 BB40 BB 41 BB42 TF53.4 BB43 BB45 (BB46 Flag)) (carrier support TF50.1 BB56 BB 57 BB59 TF50.2-BB55 BB58).

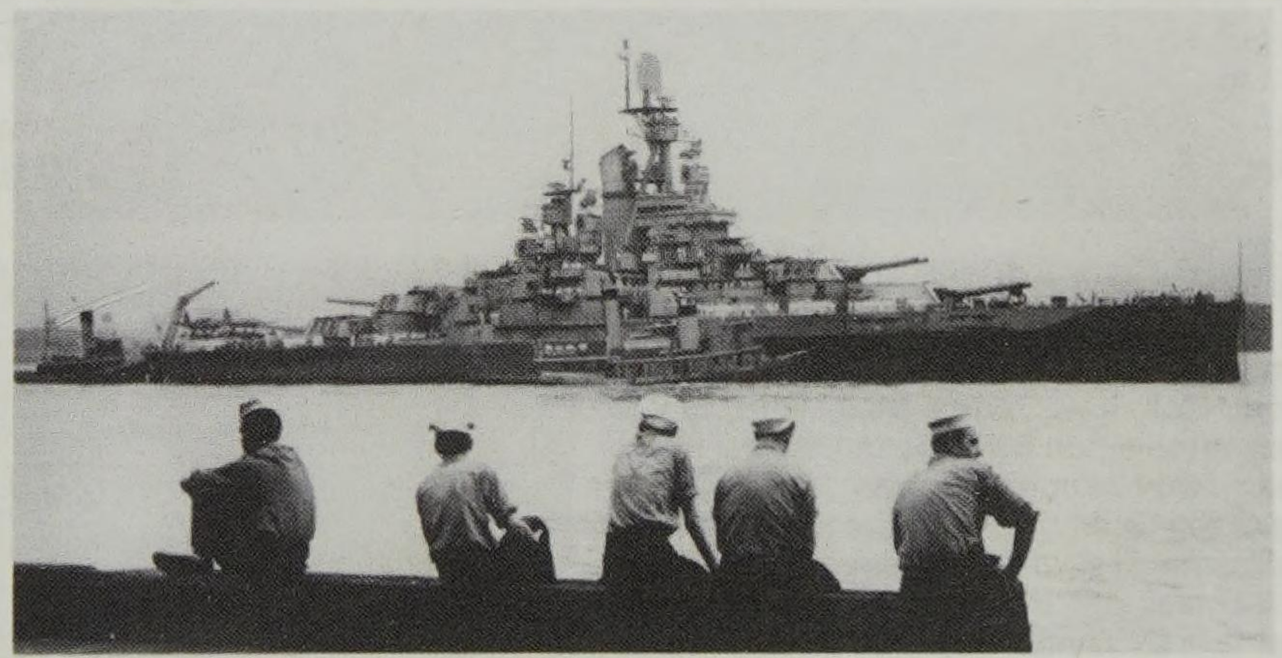
31 Jan 1944 **Operation Flintlock.** US forces land on Kwajalein, Roi, and Namur in the Marshall Islands. *17 Feb 1944* **Operation Catchpole** Eniwetok in the Gilberts assaulted by US forces (fire support group TF51-BB43 BB 45 BB46) (fast carrier support TF50.8-BB55 BB56 BB57 BB58 BB59). *1 Feb 1944* BB56 rams BB58 during night operations while BB58 was maneuvering for fueling operations, both units out of action 7 months.

22 Jan 1944 **Operation Shingle** US lands forces at Anzio Italy. No USN BB's in support.

17-18 Feb 1944 **Operation Hailstone.** US carrier forces (TF58) support by fast battleships launch massive air attacks on the Japanese Advanced Naval Base at heavily fortified Truk Island in the Caroline's. No US losses despite intense Japanese air action (carrier support (TF50.9-BB55 BB57 BB59 BB61 BB62). *18 Feb 1944* (TG50.2 BB61 BB62) sink Japanese Light Cruiser Katori.

15 Dec 1943-20 Mar 1944 **Operation Dexterity** US Forces land on 4 Islands in New Guinea Area (fire support group TF30-BB40 BB41 BB42 BB43) support landings shelling diversionary targets at Kavieng Island in the Bismarck Archipelago.

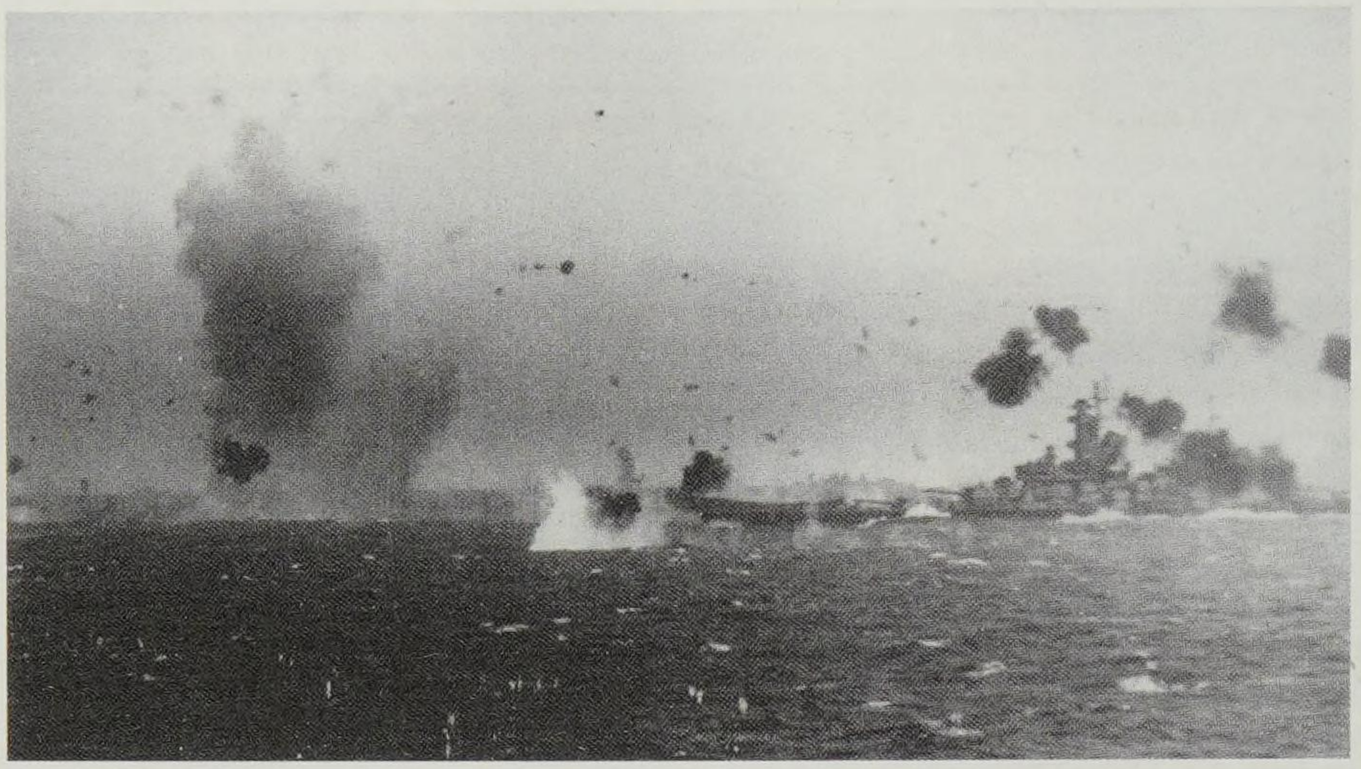
22-28 Apr 1944 **Operation Reckless.** US landings by the 7th fleet at Hollandia, New Guinea. General Macarthur's campaign to drive northward towards Japan from the Southwest Pacific commences. (TF58.3 BB55 BB57 BB58 BB59 BB60 BB62) escort supporting strikes.



Right: 15 Sep 1944 New York Harbor. USS Nevada BB36. Atlantic Duty completed BB36 returns to NYNSY for overhaul after D-DAY and the South of France operations, prior to transferring to the Pacific. BB33-BB36 BB40-BB42 served in both the Atlantic and Pacific Theaters.

6 Jun 1944 **Operation Overlord.** Allied forces of 8 nationalities land on the Normandy Peninsula of France. Fire support group (Force 'A' BB33 BB36). (Force 'C' BB33 BB35) in support at US beach heads UK BB's **Ramilles Warspite,** and Monitor (BM) **Roberts** also in support at UK beach heads. Largest amphibious operation to date, 140,000 troops, 6939 total ships in support.

15 Jun 1944 **Battle of the Philippine Sea. Operation Forager** US forces supported by the fast carriers (TF58) land on Saipan in the Marianas Islands. Japanese navy launches massive aerial counterattack from 9 carriers, (5 CV, 4 CVL) 5 BB's and land bases attempting to halt the US advance at Japan's 'inner perimeter' defenses. Japan defeated with the loss 3 carriers and 92% (473) of carrier aircraft. This battle marked the end of an effective Japanese carrier force. *21 Jul 1944* US Forces recapture Guam. (fire support group (TG52.17-BB43 BB44) (TG52.10 BB45 BB46 BB38 BB40 BB42). (Battleforce Pacific TF58.7 fast carrier support group BB56 BB57 BB58 BB60 BB61 BB62).



Mar/Apr1945. USS Missouri BB63 in action with the 3rd Fleet. A failed Kamikaze has just crashed ahead of the racing ship. Similar scenes involving all the fast battleships were commonplace events during the advance across the Pacific. Japanese air attacks grew steadily more determined and fanatical as the USN drew nearer to the Japanese Home Islands. By early 1945 the Japanese were beginning to sequester away aircraft (approximately 5000) reserved for Kamikaze missions during the expected invasion operations of Japan.

15 August 1944 **Operation Dragoon.** Allied invasion of Southern France. Fire support group (TF85 Force Delta BB35 BB36), (TF87 Force Camel BB33). BB42 is the first USN BB to enter a floating drydock the ASBD1 at Espirtu Santo. *Sep 1944* USN BB's released from Atlantic duties.

15 Sep 1944 **Operation Stalemate II** American forces land on Peleliu and Angaur in the Palau Islands (fire support group BB38 BB43 BB46 BB48).

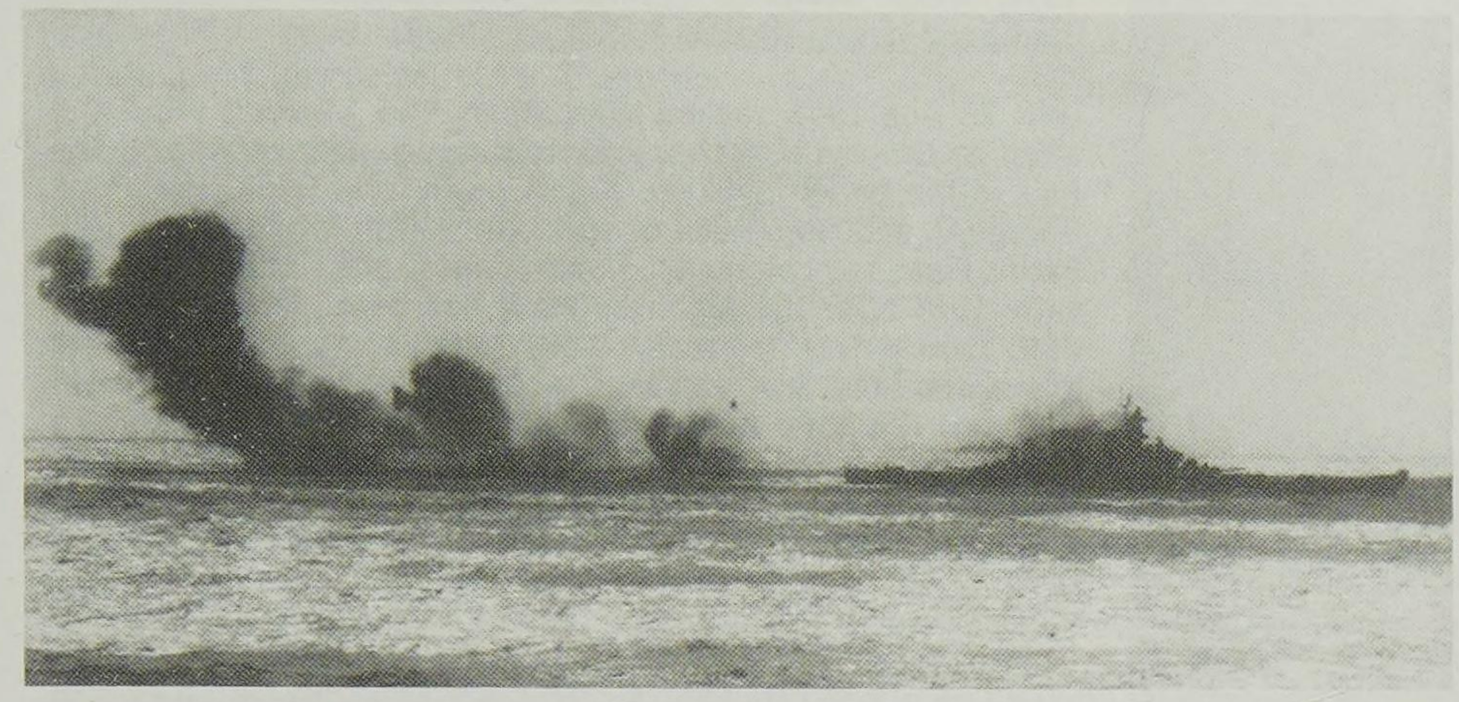
20 Oct 1944 **Operation King II.** US Forces return to the Philippines landing on Leyte. (TF78 BB41 BB46 BB48, TF79 BB38 BB43 BB44). *23-26 Oct 1944* **Battle Of Leyte Gulf**. Japan attempts to attack and destroy the US beachhead at Leyte with a three pronged attack comprised of northern Decoy Force of 4 near empty aircraft carriers to draw off the US Fast Carrier Striking Force. A center group of 3 BBs (**Yamato, Musashi** and **Nagato**) 8 cruisers and a southern force of 2 BBs (**Fuso** and **Yamashiro**) and 6 cruisers to attack the US amphibious force in a north/south "pincers movement" off the landing beaches. *23 Oct 1944* **Battle of the Sibuyan Sea** US carrier planes attack center group sinking BB **Musashi,** surviving Japanese ships appear to retreat. *24 Oct 1944* **Battle off Samar** The Center force reverses course and stumbles on US Support Task Force of 6 Escort Carriers (CVE) and 7 support ships (DD's/DE's) providing air cover for forces ashore off the island of Samar. Center force sinks 1 escort carrier, 2 destroyers and 1 destroyer escort, but is forced to retire. *24 Oct 1944* **Battle of Cape Engano** US fast carrier force strikes Northern Force of decoy ships and sinks 4 carriers. US Battleforce Pacific (TF34 BB56 BB58 BB60 BB61 BB62) detached for surface action against Northern Force but recalled prior to engaging. (BB64 while not present, due to fueling, was also in TF38 support). **USS Princeton** CVL23 sunk by bombs off Luzon PI. *25 Oct 1944* **Battle of Surigao Strait.** US amphibious support battleships (fire support group (TF78/79 BB38 BB41 BB43 BB44 BB46 BB48) make night intercept of Japanese Southern Force in the Surigao Straits. Japan loses 2 BBs, remaining Japanese forces withdraw. This was to be the last battleship to battleship action in WWII. *26 Oct 1944* 1st Kamikaze attacks against US ships off Leyte resulting in loss of escort carrier **USS St Lo** (CVE63) and damage to 4 other CVE's. *Nov 1944* **Task Group 77.2** Formed in Leyte Gulf to provide continued fire support (TG77.2 BB40 BB45 BB 46 BB 48). Leyte Gulf actions total losses USN: 1 light carrier, 2 escort carriers, 3 destroyer types. Japanese total losses: 4 aircraft carriers, 3 battleships, 8 cruisers, 12 destroyers. This was the largest naval battle in history and resulted in the end of the Japanese Navy as an effective fighting force.

17/18 Dec 1944 **Typhoon Cobra** Major storm damage off the Philippine Islands to the ships of TF38. 9 ships are required return to bases for repairs. 3 destroyers are lost. (BB55 BB56 BB57 BB59 BB60 BB61 BB62 BB64).

9 Jan 1945 **Operation Mike I.** US Forces land in Lingayen Gulf on Luzon in the Philippine Islands. Sustained kamikaze attacks. (fire support group TG 77.2 Unit1 BB41 BB44 BB48 Unit 2 BB38 BB40 BB44 BB45).

Jun 1944 Majuro Lagoon Marshall Islands. Front LtoR New Jersey BB62 Iowa BB61, back Washington BB56 North Carolina BB55 and other support ships before the Marianas Operations and the Battle of the Philippine Sea where Japanese Carrier air power was effective destroyed. The fast BB and fast CV combination proved to be the most highly effective tactical naval unit ever employed in naval combat. The CV/BB team virtually eliminated the Japanese Navy by the close of WWII. dbc

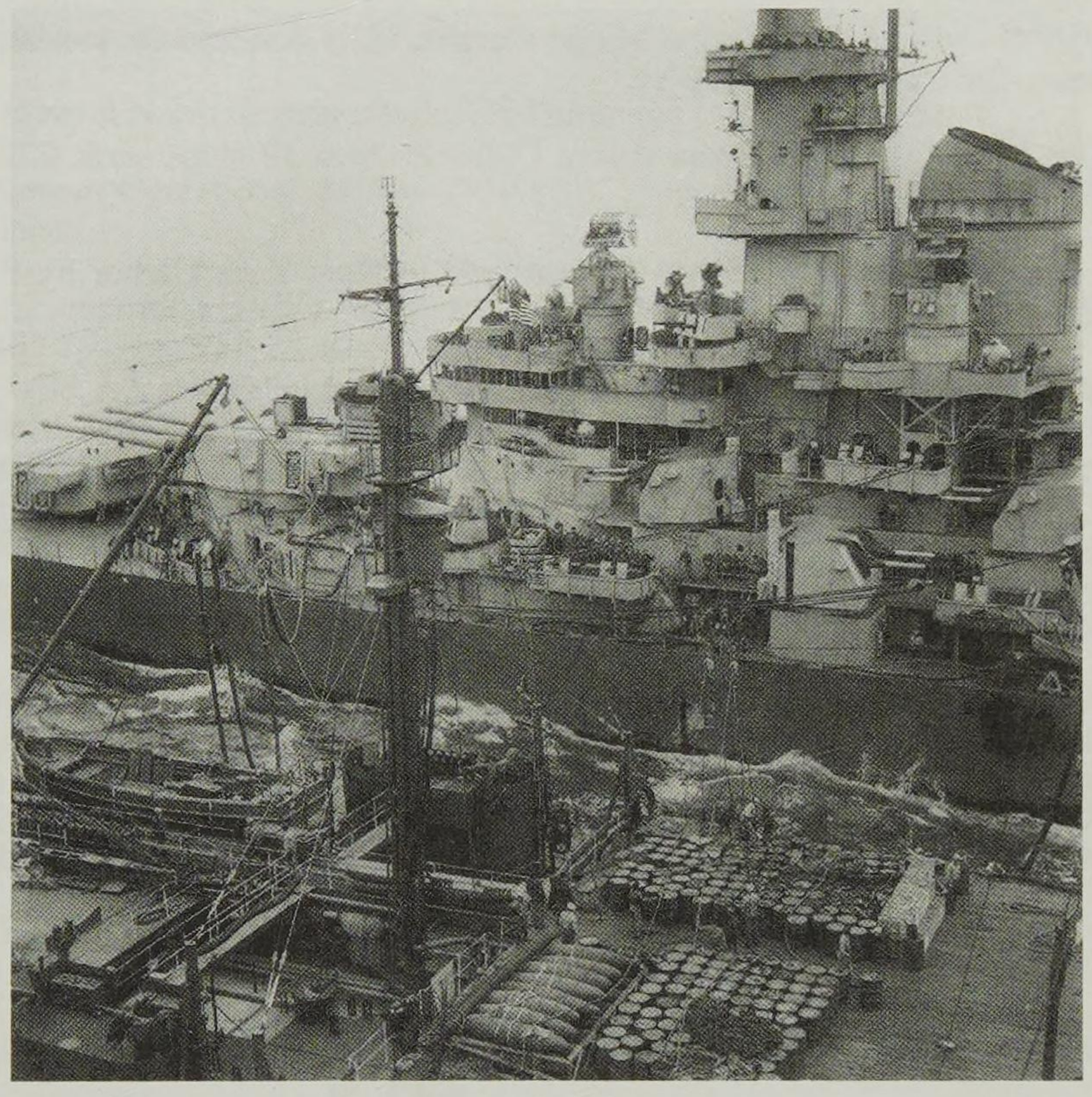
Jan-Mar 1945 **Pacific Raids**. US carrier task forces span the Western Pacific striking Japanese targets in Indochina, Formosa, and on the China mainland. *16 Feb 1945* US carrier forces attack the Japanese Mainland. Tokyo and other cities bombed (fast carrier support force TF34 BB55-BB64). *19 Mar 1945* (CB1 CB2) defend fleet carrier **USS Franklin** (CV13) which was severely damaged by a bomb attack off the coast of Japan.



11 Apr 1945 off Okinawa. USS Missouri BB63 after being struck amidships by an A6M5c Zero Type Kamikaze. While the smoke plume is impressive, the actual damage was minimal. USN battleships were better able to survive Kamikaze strikes than other types of ships. Kamikaze tactics were one of the most effective weapons the Japanese deployed. And while the ships losses, damages, and causalities inflicted on the USN were serious, overall Kamikaze tactics accomplished little to stem the inexorable US advance toward Japan. The emergence of Kamikaze tactics were partial responsible for the decision to deploy atomic weapons. To avoid having to endure the anticipated massive Kamikaze attacks during the projected amphibious operations on the Japanese Home Islands scheduled for late 1945.

***19 Feb 1945* Operation Detachment.** US landings on Iwo Jima in the Bonin Islands. Increased Kamikaze attacks inflict heavy damage on US Fleet (fire support group TF54 BB33 BB34 BB35 BB36 BB42 BB43). (fast carrier support force TF34 BB55 BB56 BB57 BB58 BB59 BB62 BB64 CB1 CB2).

***1 Apr 1945* Operation Iceberg** US landings on Okinawa in the Ryukyu Islands. *Apr-May 1945* Kamikazes sink 28 US ships and cause major damage to 131 addition ships. Heaviest USN losses of WWII. *7 Apr 1945* Japanese BB **Yamato** sorties from Japan to attack beachhead, the ship is sunk by US carrier forces before reaching the Okinawa Area. First occupation of Japanese territory by US forces. (fire support groups TF54 group-1 BB35 BB 46, group 2-BB33 BB45, group 3-BB43 BB36, group 4-BB42 BB48, group 5-BB34 BB40) (TF34 fast carrier support group BB56-BB64 CB1 CB2).



Right: 31 Jul 1945 at sea. USS Missouri BB63 fueling during an underway replenishment evolution. With Radar being the 1st most significant technology. The second most significant technology the USN employed in WWII was underway replenishment and the fleet supply train, which enabled the carrier striking forces to remain operating in forward areas eliminating long transits to bases for resupply. The 1st USN battleship to refuel underway was the USS Maryland BB46 from the Fleet Oiler USS Cuyama AO3 in Oct 1940.

12 Apr 1945 **President Franklin D Roosevelt** dies. VP **Harry S Truman** becomes president.

1 May 1945 Australian Forces land in New Guinea at Balikpapan on the Island of Borneo. *10 Jun 1945* Australian forces land at Brunei.

5 Jun 1945 **Typhoon Viper.** Moderate damage to TF38 off Okinawa.

12 Aug 1945 **USS Illinois** 5th Iowa Class Battleship (BB65) cancelled. Ship is 22.9% complete and unlaunched. Hull material scrapped in place in 13 years later in 1958.

Jul-Aug 1945 US carrier forces (TF38) supported by (BB55 BB57 BB58 BB59 BB60 BB61 BB63 BB64 CB1 CB2) launch heavy, almost daily attacks on Japanese Home Islands. Remainder of Japanese warships destroyed or disabled in port. US Fast Battleships bombard targets on the Island of Honshu (TF34 BB57 BB58 BB59 BB60 BB61 BB63 BB64).

16 Jul 1945-7 Aug 1945 **Task Force 95 Operations** Battlecruisers (CB1 CB2) 4 light cruisers and 9 destroyers conduct anti-shipping sweep in East China Sea. 2nd sweep by Task Force 95 includes 3 battleships (CB1 CB2 BB36 BB43 BB44).

6 Aug 1945 **1st Atomic Bomb** dropped on Hiroshima by USAAF B29. *10 Aug 1945* 2nd Atomic Bomb dropped on Nagasaki.

15 Aug 1945 **Hostilities End.** Cease fire declared as Japan accepts the terms of the Potsdam declaration of unconditional surrender.

29 Aug 1945 **US Fleet enters Tokyo Bay Japan:** (TF35 BB40 BB41 BB42 BB45 BB48 BB57 BB61 BB63).

Left: 28 Aug 1945 Sagami Wan Japan. USS Missouri BB63 and allied battleships at anchor prior to the surrender ceremony. The BB's in the background are British battleships (LtoR) HMS King George V, and HMS Duke of York. The British formed the British Pacific Fleet and commenced operations in the Pacific Theater in early 1945 after the Japanese Navy had been defeated by the USN. The UK fleet operated initially in the Indian Ocean and later joined the USN Fast Carrier Groups supporting operations off Okinawa. The Royal Navy was unable to provide the logistics of a fleet supply train, and resultantly UK ships were almost exclusively dependent on the USN for all fuel, ammunition and supplies. UK Carriers operating in the Pacific were equipped with USN supplied aircraft, and all ships were refitted with USN light AA batteries.

2 Sep 1945 **Japan Surrenders.** The Imperial Japanese Government surrenders aboard the Battleship **USS Missouri** anchored in Tokyo Bay. TF35 and 2 British Battleships HMS **Duke of York,** and HMS **King George V** present. *Sep-Nov 1945.* Occupation duties of Japanese Territories commence (BB61 BB62 BB63 BB64) continued until the Japanese Government reinstated in 1955.

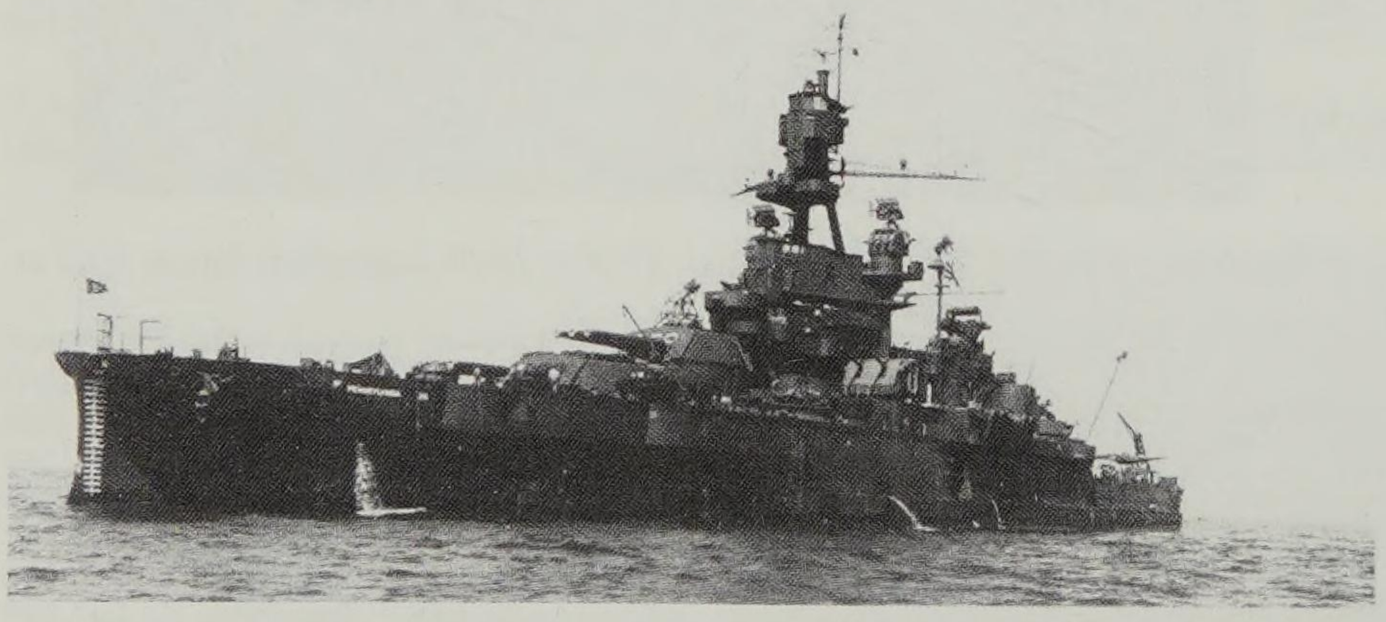
Sep 1945-Jul 1946 **Operation Magic Carpet.** USN conducts large scale ferrying operations returning US Troops from overseas bases to the US. (all USN BB's)

9 *Oct 1945* **Typhoon Louise** strikes Okinawa Area 12 ships sunk, 222 grounded, 32 heavily damaged. No damage to USN BB's.

26 Oct 1945 **Navy Day Fleet Review** held in New York Harbor by President Truman aboard **USS Missouri** which becomes flagship of the US. (BB63 BB34).

1946-48 **US military demobilizes.** Postwar overhauls (20mm AA btry's removed) and training cruises (1946-47) conducted by BB55 BB56 BB61-BB64 USN plans to retain these 6 BB's in active service 12 BB's in reserve. Due postwar funding cuts USN removes all but 1 battleship (BB63) from active service by 1949. Older battleships are stricken and disposed of (BB33 BB34 BB36 BB38) expended as targets at Bikini Atoll Atomic Bomb tests. (BB35) becomes a war memorial at Houston, Texas. (BB40 BB42) scrapped, (BB41) converted to Gunnery Test Ship and reclassified as a Miscellaneous Auxiliary Type (AG128) (BB43-BB46 BB48 BB55-BB62 BB64) are placed out of commission, in reserve. *17 Feb 1947* Construction of (BB66) suspended indefinitely when 69.2% complete, construction of (CB3) suspended indefinitely when 82.4% complete.

6 Jul 1946 **Operation Crossroads.** US Military conducts Atomic Bomb tests on ships anchored at Bikini Atoll in the Pacific (Joint Army/Navy TF1) (BB33 BB34 BB36 BB38) and damaged Japanese BB **Nagato** included in target fleet. Tests are comprised of Shot Able (23 Kiloton MK3A Model 1561 air dropped device from USAAF B29) and Shot Baker (23 Kiloton MK3A underwater detonation by device suspended 90' under the LSM60). Results demonstrate battleship types are better able to withstand the effects of nuclear detonations but, subject to inoperability due to radioactive contamination from surface bursts.



15 Jun 1946 USS Pennsylvania BB38 anchored at Bikini Atoll for Operation Crossroads. Note the draft markings forward and name on bow. The ship is fitted with extensive test equipment to record the effects of the Atomic Detonations. Paint is Ms21. The ship remains in commission as evidenced by the Naval Jack flying forward. Commissioned USN ships fly the Jack forward and the National Ensign aft when they are at anchor or moored.

24 Jun 1948 **Berlin Crisis.** Soviet forces blocks ground access to the Western controlled sectors of Berlin. US responds by supplying Berlin with the USAF MATS from the air in the "Berlin Airlift". Prelude to the Cold War.

1949 **USS Missouri** remains only US battleship in active service. 14 battleship types, (5 slow battleships and 9 fast battleships), plus 2 battlecruiser types, are held in reserve. 1 battleship and 1 battlecruiser remain uncompleted. 1 ex-battleship is in service as a gunnery training ship (AG128).

29 Aug 1949 USSR detonates first Soviet Atomic Bomb (RSD1 22kt). Post World War II era ends, Cold War Era begins.

1 Oct 1949 **Communist Victory.** Chinese Civil War (1945-1949) ends. People's Republic of China declared. Nationalist Chinese retreat to Formosa.

1950-1952 Formosa Straits Patrols to halt Communist Chinese artillery bombardment of Nationalist Chinese Forces on Formosa.

17 Jan 1950 BB63 runs aground on Thimble Shoals VA. *1 Feb 1950* BB63 refloated. Minimal hull bottom damage.

29 Aug 1946. Philadelphia NSY Reserve Fleet. BB44 (top) and BB43 in drydock 5. BB57 in lower right foreground. Armor cruiser USS Olympia ACR6 in left foreground. USS Los Angeles CA135 and USS Chicago CA136 in drydock4 (center right).The USN maintained 6 reserve groups that stored BB/CB types. The USS Olympia was ADM Dewey's flagship at the Battle of Manila Bay during the Spanish American War of 1898 and was stored as a relic in Dec 1922. ACR6 became a museum ship in 1957.

25 Jun 1950 **Korean War Starts.** Soviet and Chinese Communist client state North Korea invades South Korea. (BB63 is the only US Battleship in commission (AG128 ex BB41) is also in commission.

27 Jun 1950 **UN passes resolution** to assist South Korea to repel North Korean attack. US Forces deploy to the Korea.

14 Sep 1950 (BB63) joins Task Force 77 of Japan for Korean Operations. *21 Nov 1950* (BB62) recommissioned. *3 Mar 1951* (BB64) recommissioned. *25 Aug 1951*(BB61) recommissioned.

1950-1953 (BB61-64) operate with TF77 in Korean Waters supporting UN forces ashore. (BB61 *1 Apr 1952-19 Oct 1952*) (BB62 *7 May 1951-13 Nov 1951, 12 Apr 1952-15 Oct 1953*) (BB63 *19 Sep 1950-28 Mar 1951*) (BB64 *26 Nov 1951-1 Apr 1952*).

1950 USN authorizes conversion of (BB45) to Radio Controlled Target Ship (AG) SCB38 project to support Air to Surface Missiles development. Project canceled due to funding constraints.

10-24 Dec 1950 Evacuation of UN Forces from Hungnam, North Korea (BB63).

13-15 Dec 1950 UN Forces Land at Inchon, South Korea (BB63).

21 Aug 1951 (BB64) grounds in Hudson River NY. Refloated 22 Aug 1951. No damage.

26 Feb 1952 Incomplete battlecruiser (CB3) scheduled for conversion to carrier task force command ship (CBC3) (SCB83). Armed with 12-12 X 1 5"/54 and fitted with extensive flag, radar, and communication facilities. *1954* is the projected completion date. *1953* project canceled.

Sep-Nov 1952 (AG128) 2 MkI twin missile launchers installed aft to perform research, development, test and evaluation of Terrier BW series Surface to Air Guided Missiles. *28 Jan 1953* First at sea Terrier missile launch by (AG128).

1 Nov 1952 US tests first thermonuclear hydrogen fusion bomb (Shot Mike I) type TX14 10.4 Megaton yield at Christmas Island.

27 July 1953 **Korean Cease Fire**. Hostilities end. Truce declared. Negotiations start and continue to date (2009).

Left: *Sep 1953* Mk23 (KATIE) **Nuclear Shell** 15/20 Kiloton yield developed for 16"/50 Mk7 gun. *1955* Mk23 projectile placed in service. (BB61 BB64) forward magazines modified to handle Mk23 Projectiles 10 rnds normally deployed. *Oct 1962* Mk23 removed from service.

1954 USN authorizes conversion of uncompleted (BB66) to single ended Guided Missile Battleship (BBG1) armed with 6 (2X3) 16"/50's forward and 2x 2/Terrier launchers aft. *1954* (BBG1) conversion cancelled. Resources diverted to (CAG1/2) **Boston** class Heavy Cruiser conversions.

1953-1957 Training cruises, NATO exercises. Oversea deployments with the 6th Fleet in the Mediterranean and the 7th fleet in the Western Pacific (BB61 BB62 BB63 BB64).

30 Sep 1954 Nuclear Submarine **USS Nautilus** (SSN571) first nuclear powered vessel commissioned.

26 Feb 1955 (BB63) decommissioned placed in reserve at Bremerton WA. Maintenance Category 'A'.

6 May 1956 (BB64) collides with destroyer **USS Eaton** (DDE510). (BB64) sustains bow damage. *May-Jun 1956* 68' section of (BB66's) bow used to replace (BB64's) damaged bow. *18 Oct 1955* (BB64) grounded in NY Harbor refloated in 45mins.

1 Nov 1955 Guided Missile Heavy Cruiser **USS Boston** (CAG1) commissioned. First operational combatant equipped with Anti-Aircraft Guided Missiles. (2 X 2 Mk1 BW-0 Terrier Missile Launchers).

17 Sep 1956 (AG128) decommissioned at Norfolk VA. *28 Nov 1956* Stricken and sold to for scrap.

21 Aug 1957 (BB62) decommissioned at Bayonne NJ. *11 Aug 1962* moved to Philadelphia. Maintenance Category 'A'.

4 Oct 1957 USSR launches **Sputnik** first artificial earth satellite. Beginning of operational long range Strategic Missiles (ICBM) Programs.

1956 **Ballistic Guided Missile Monitor Battleship BBMG** Projects. Proposals to convert BB61 class to either Scheme I, shipping 4 Talos launchers (12 Tartar Launchers and 16 liquid fuel IRBM's) or Scheme II, (2 Talos launchers 4 Tartar launchers 12 liquid fueled IRBM's). No conversions authorized.

1958 **Guided Missile Battleship** (BBG1) Program/Study for the conversions of BB61 class as a scheme II double ended 2 TALOS SAM, 2 TARTAR 1 Regulus II and/or 16 Polaris SSM/IRBM, with 2 MACK's (MAst and staCK combined). Or to scheme I BBG configuration same as the scheme II conversion but retaining the forward 16" turrets. *31 Jul 1961* Projected completion of 1st (BBG1) class ship. *1958* Program canceled. Resources diverted to Guided Missile Cruisers **Albany** class (CG10-CG12).

24 Feb 1958 (BB61) decommissioned at Philadelphia. Maintenance Category 'A'.

8 Mar 1958 (BB64) decommissioned at Bayonne NJ, *17 Aug 1962* moved to Philadelphia. Maintenance Category 'A'. Fire during decommission preparations in forward magazines. Damage not repaired.

9 Mar 1958 For the 1st time in 62 years the USN has no Battleship Types in commission.

9 Jun 1958 (BB66 CB3) (Incomplete) stricken and sold for scrap.

1 Mar1959 (BB43-46 BB48) Stricken and sold for scrap.

1 Jun 1960 (BB55 BB56 CB1 CB2) Stricken. (BB56 CB1 CB2) sold for scrap. (BB55) becomes a museum ship.

1 Jun 1962 (BB57 BB58 BB59 BB60) Stricken. (BB57 BB58) sold for scrap. (BB59 BB60) become museum ships.

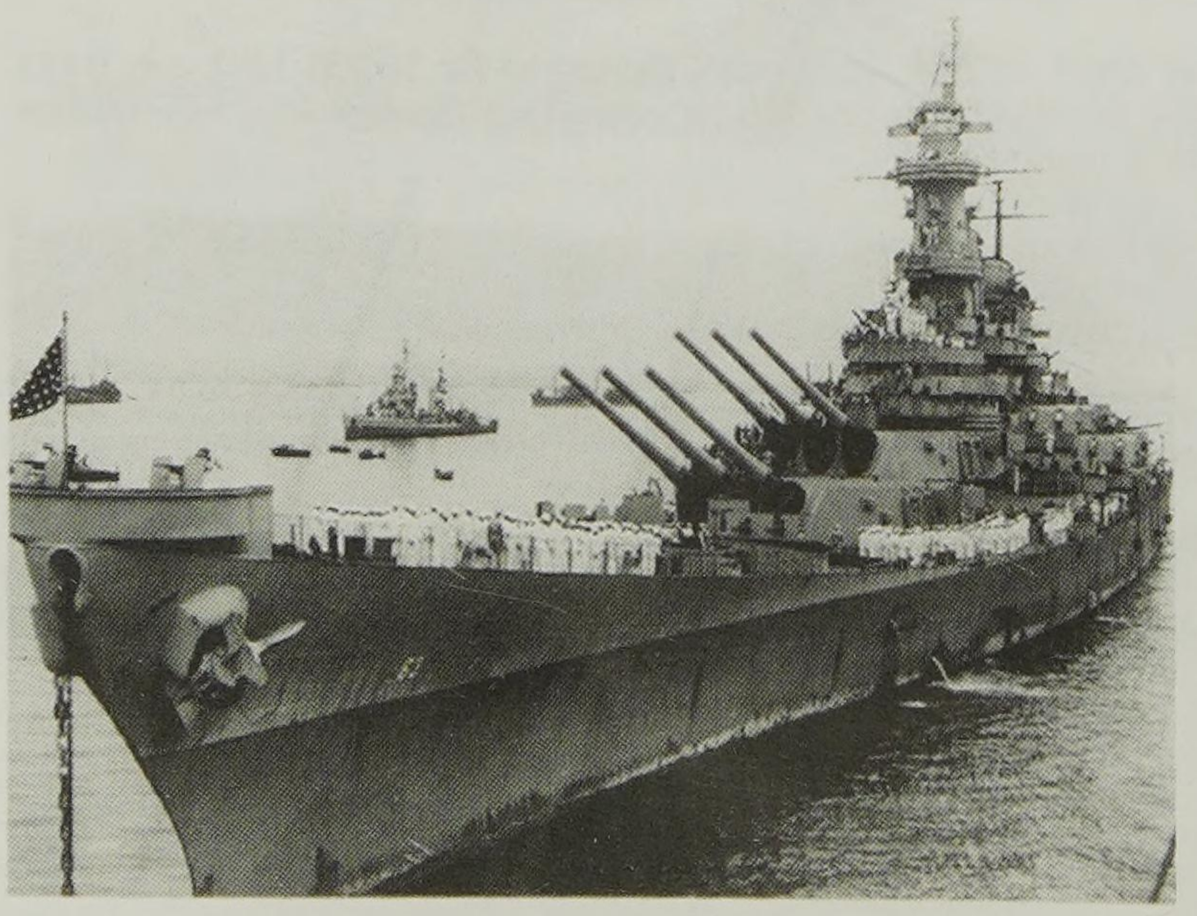
1958-1964 (BB61) class usage studies for conversion for further service. Included are proposals for Satellite Launching Ships (AGSL), Heavy Amphibious Assault Ships (CS), and Fleet Replenishment Ships (AOE) Programs. Preliminary design work only, no conversions authorized. Retained in reserve as fire support ships.

9 Sep 1961 **Nuclear Guided Missile Cruiser** USS Long Beach (CLGN9) first nuclear powered surface ship commissioned.

Oct 1962 **Cuban Missile Crisis.** USSR emplaces IRBM's (SS4/SS5) on the Island of Cuba. US imposes naval blockade on Cuba, forces the USSR to remove the missiles.

1963 **Disposal Considerations.** DoD evaluates disposal of (BB61-BB64). Retained in reserve per USMC request against future fire support requirements. State of Missouri expresses interest in (BB63) as museum ship. Potentially to be moved to St Louis Mo. for display.

22 Nov 1963. **President Kennedy assassinated**. All remaining USN BB's in reserve (BB61-BB64). End of Early Cold War Era.



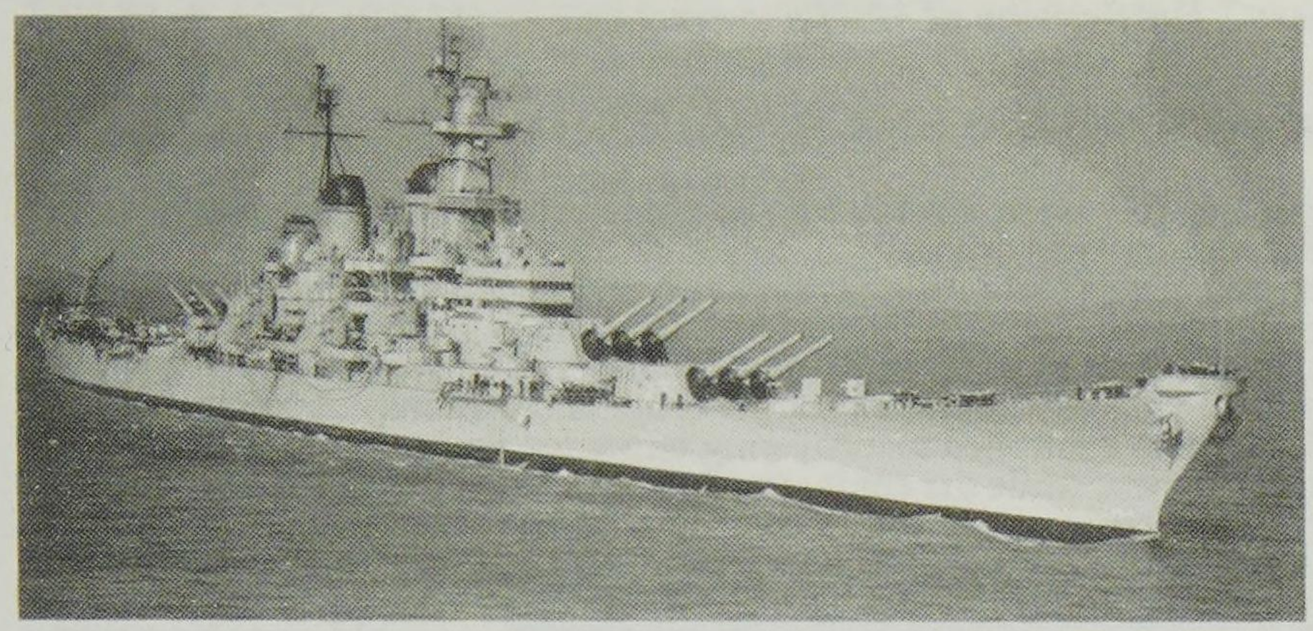
Left: 2 Sep 1945 Tokyo Bay Japan. USS Missouri BB63 stands by to receive the official Japanese Delegation for the formal signing of the surrender documents. In Sep 1945 a bronze plaque was embedded in the deck at the location of the surrender table which reads as follows:

"Over this spot 2 September 1945 the instrument of formal surrender of Japan to the allied powers was signed. Thus bringing to a close the Second World War.

This ship was at that time anchored in Tokyo Bay. USS Missouri BB63"

WWII started and ended for the United States with

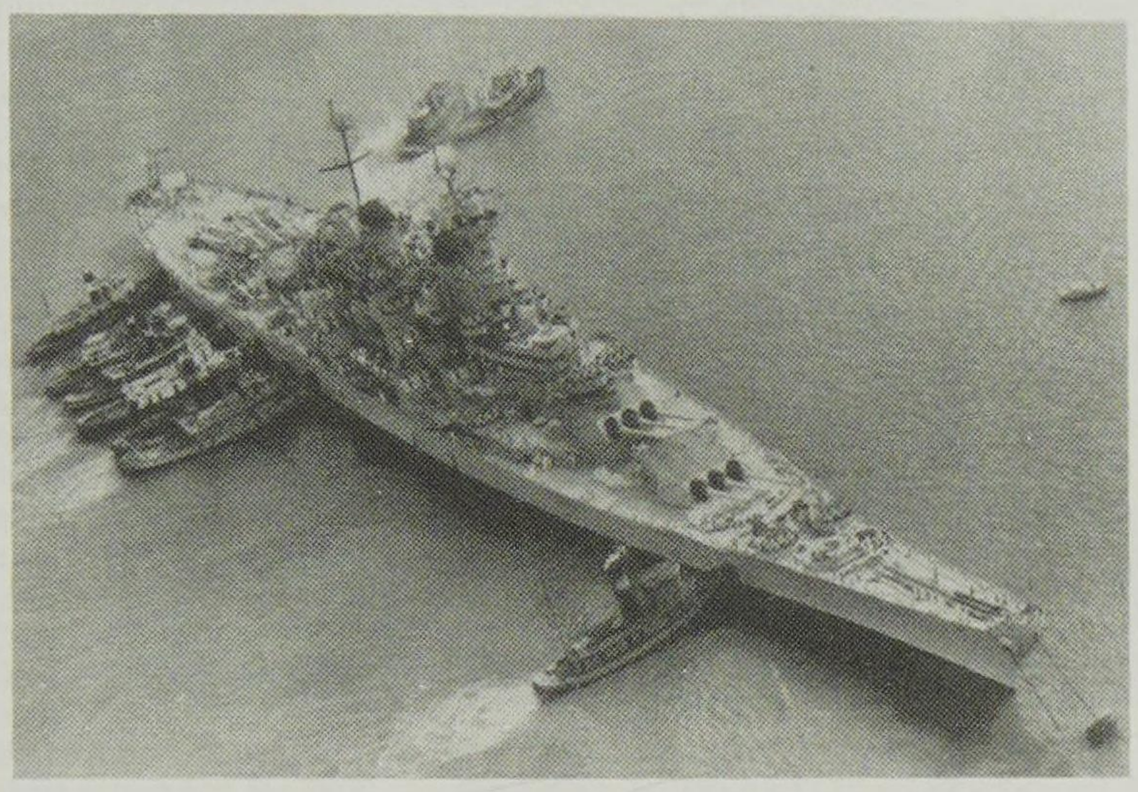
BATTLESHIPS



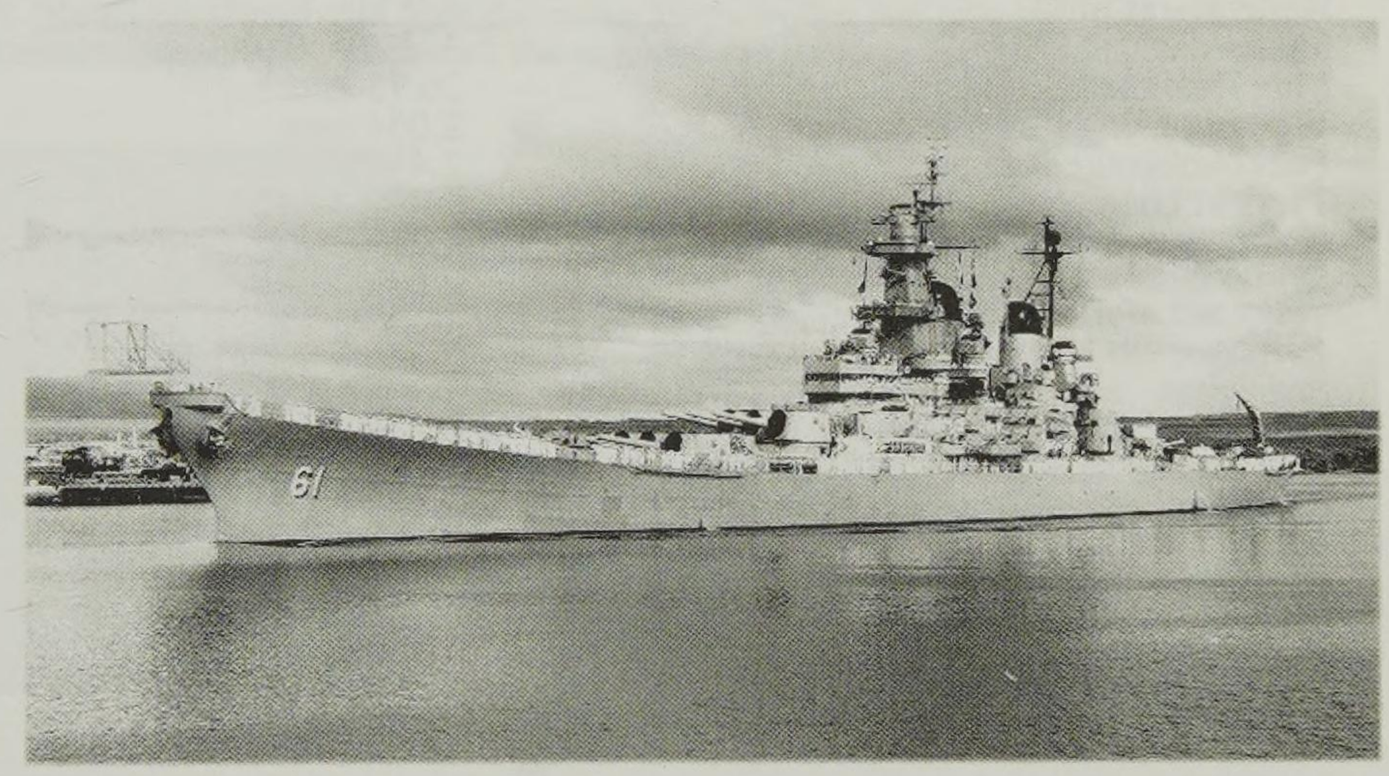
Left: 1948 off San Francisco. USS Iowa BB61 in final configuration before decommissioning in 1949. Note the empty forward 40mm tubs, and small hull numbers. Paint is standard postwar Ms 13 with black stack caps. dbc

Below: 6 May 1956 off Norfolk USS Wisconsin bow damage after collision with DD USS Eaton.

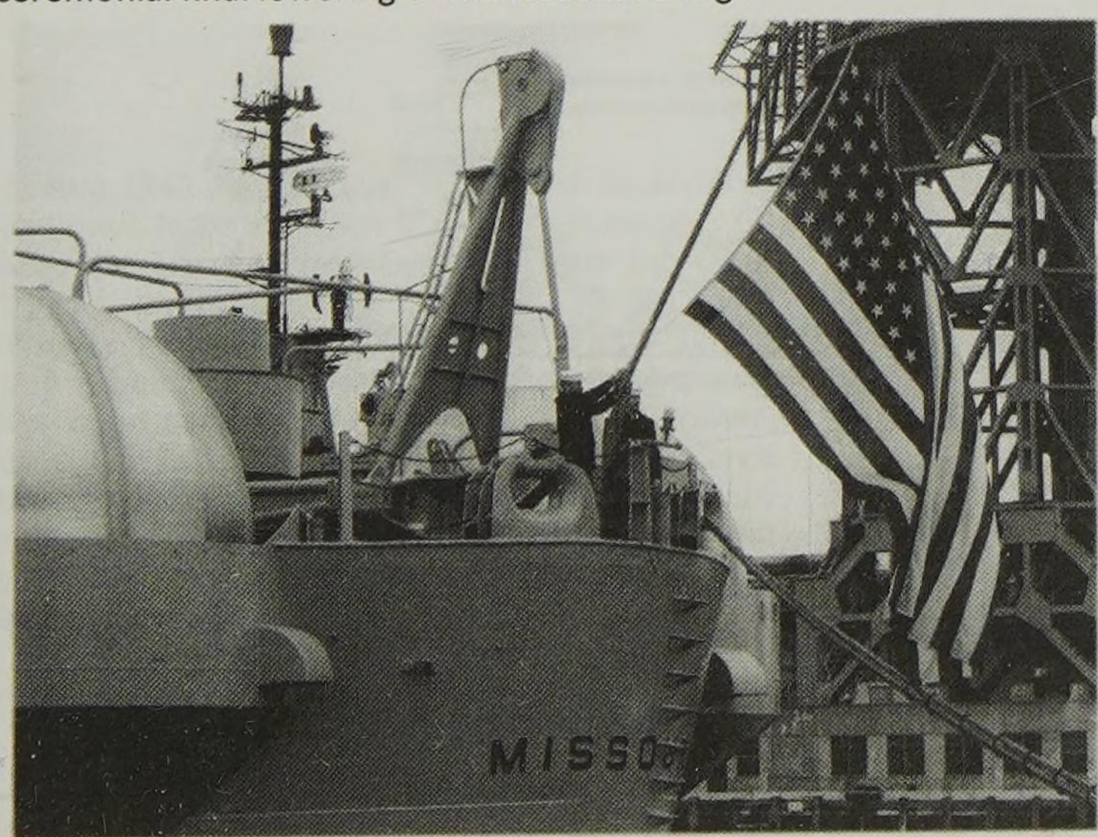
Right: 22 Aug 1951 Hudson River New York Harbor. USS Wisconsin BB64 with stern grounded, and being pushed back into the deep water channel. The ship was not damaged in this incident. Note the bow is moored to a buoy in order to pivot the ship. AP photo. dbc



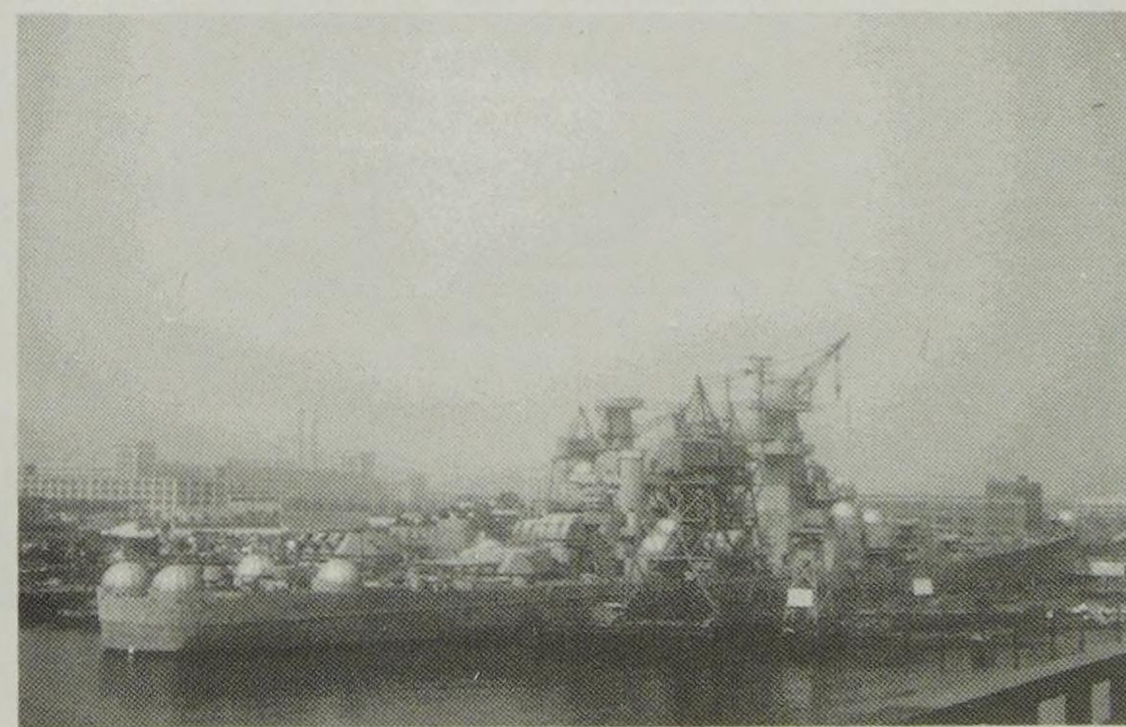
Right: 24 Oct 1952 Pearl Harbor. USS Iowa BB61 arrives from the Korean Theater with the crew at quarters. The BB61 is enroute to overhaul at Norfolk NSY.



Below: 26 Feb 1955 Puget Sound NSY. USS Missouri BB63 is placed 'out of commission in reserve' with the ceremonial final lowering of the National Ensign.



Below: Sep 1961 USS Alaska CB1 Lipsett Co Kearny NJ. CB1 awaits scrapping. In the background is the partial scrapped USS Washington.



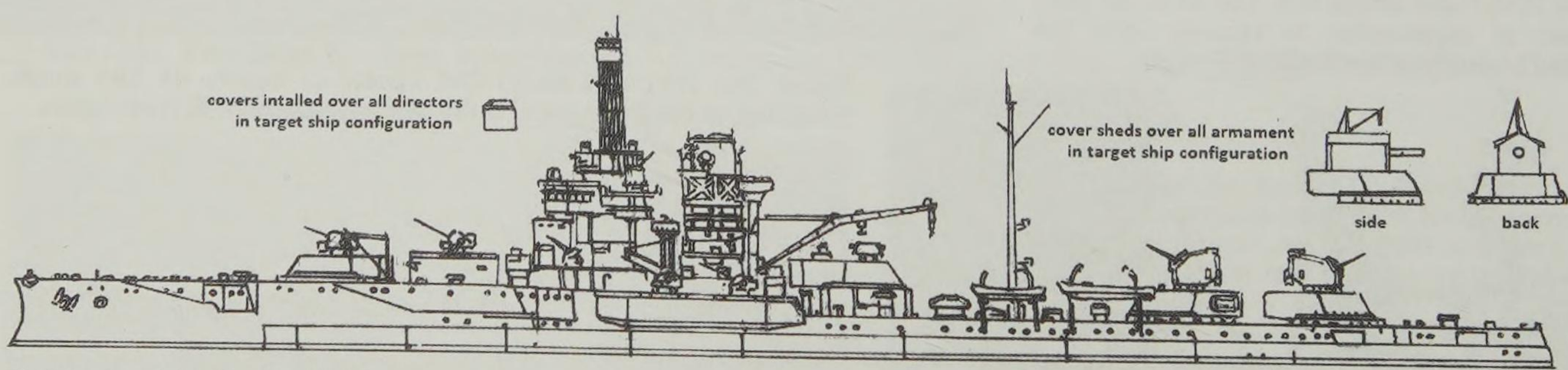
Florida Class: 2 Battleships of 1907:

USS Florida BB 30 (scrapped 1924) USS Utah AG 16 (BB 31)

The BB30 class were typical 1st generation ships. But they were considered superior to contemporary foreign designs. Like all 1st generation designs the BB30 class incorporated what was basically a continuation of predreadnaught protection concepts of relatively thin armor over a large area concentrated in a full hull length waterline belt. The BB30 class were originally built with 2 stacks and 2 cagemasts, reciprocating engineering plants, and were coal fueled. Both ships were rebuilt in the 1920's with a single funnel and cagemast forward, polemast aft, and converted to oil fuel. In 1924 BB30 was scrapped to comply with the Washington Naval Treaty. In 1930 BB31 was converted to Radio Controlled Target Ship, and officially redesignated as a Miscellaneous Auxiliary (AG16). The conversion provided a radio controlled maneuvering target for fleet gunnery and bombing exercises. All main guns were removed from the main battery turrets, while the empty turrets housings remained in place. In 1935 Utah was further modified when the forward main battery turret housings, and the 02 deck level had an assortment of AA guns: 4 single 5"/51's 4 single 5"/25's, 4 single 5"/38's 1 1.1," and 8 .50 cal., fitted to provide an AA gunnery training capacity which would accompany the Battlefleet. AG16 received further modifications in Aug 1940, when enclosed 5"/38 single mounts were added to turret housings 4 and 5. Two Mk19 fire control directors were added abaft the cagemast. Removable protective sheds (doghouses) each topped with small derrick were mounted over all armament, and director positions when the ship was configured as a target ship. Removable shields and timbers lashed longintunal on the main deck were fitted to prevent damage when the ship was struck by practice projectiles, and bombs. Heavy radio receiving antennas for the remote control equipment were mounted between the forward cage mast and the mainmast. The Utah retained this appearance until struck by 2 aerial torpedoes during the Pearl Harbor attack. Which resulted in the ship capsizing in less than 10 minutes. AG16 was not salvaged and raised, but during early 1942 the ship was partial righted and moved inwards towards Ford Island to provide increased clearance to the main shipping channel. In early 1943 the ship was partially scrapped in place with the removal of all top hamper. The hulk of the AG16 remains today in the 1942 position. In 1950 a flagpole was erected and small plaque placed on the ship. In 1972 the hulk of the AG16 was designated as a war memorial. In 1995 a minimal visitor's center and memorial were built on Ford Island opposite of the AG16. AG16 was not, as often reported, mistaken for an aircraft carrier, but as a unknown and unexpected US battleship (probably USS Arkansas). In postwar interviews with the pilots involved they stated the loss of the Utah was a case of target misidentification. As the Japanese had been directed not to attack AG16 and had realized their mistake immediately after weapons release.

Utah Class Target Ship Statistics AG16 1941

Displacement	Std/FL as mod		24,800 tons/27,700 tons
Dimensions	Length WL/OA/Beam		510' 0"/521' 6"/106"0"
Draught (max)			28' 4"
Machinery Type			as mod.4 Curtis Geared Turbines
Boilers as mod			4 White Foster oil fired
Shafts/designed SHP			2 shafts 28,000 shp nominal
Max Designed Speed			20.75 knts
Weight of Eng Plnt			2,064 tons
Fuel bunkerage/Range			2,434 tons/7220 nm @12 kns
Tactical Diameter			640 yds @ 21 kns
GM			4.01
Armament	Main	AG 1935/41	0/0
	Sec	AG 1935-41	4-5"/25
	AA	AG 1935-41	2-3"/50 4-1.1"
	Lt. AA	AG 1935/41	8-.50 cal/15-.50 cal
Protection	Main (wl) Belt/Incline		9-11"8'/0°
	Deck Total/Decks		5.12"/3 decks
Catapults/Aircraft	As AG (1935)		none



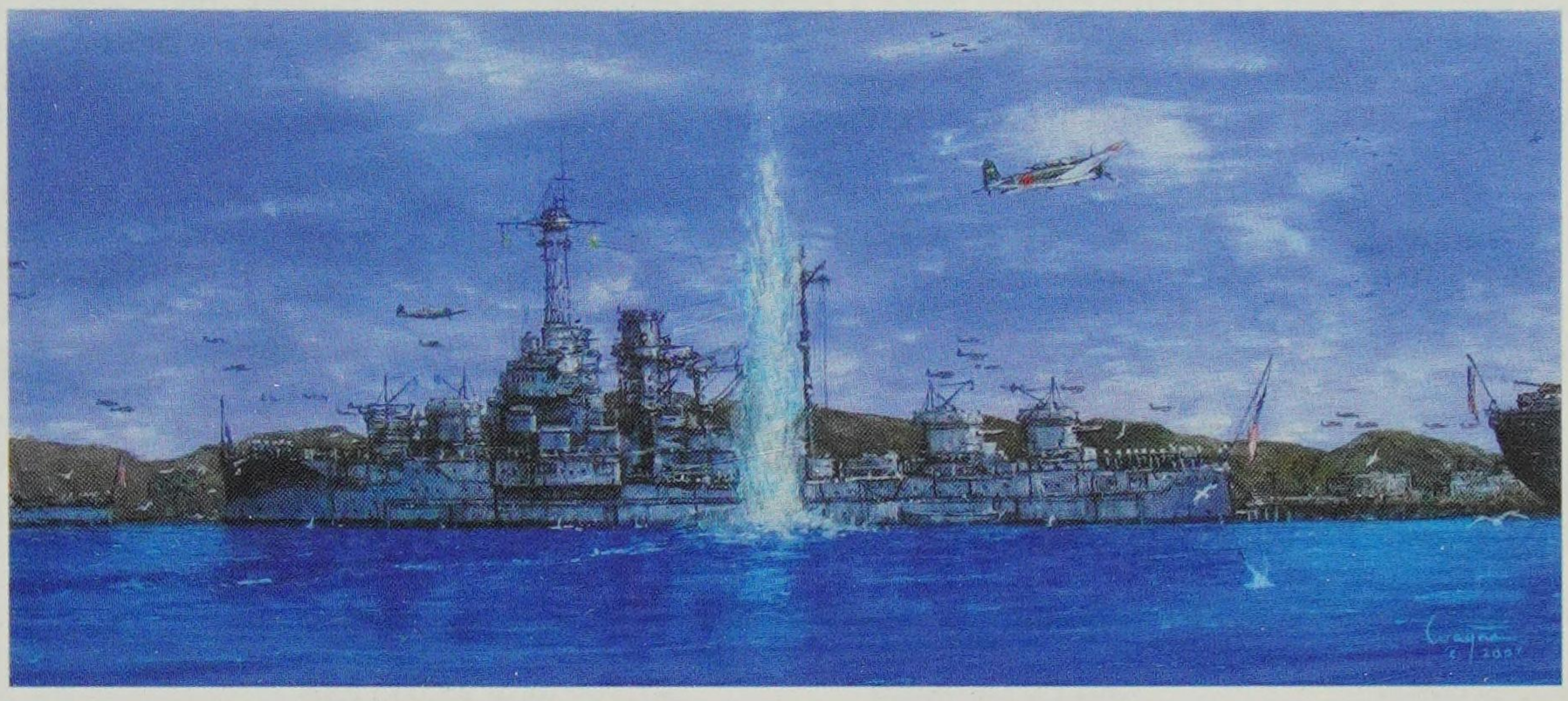
USS Utah AG16 Nov 1941 Ms1

USS Utah AG16 (BB 31) Call Letters: **NITR**

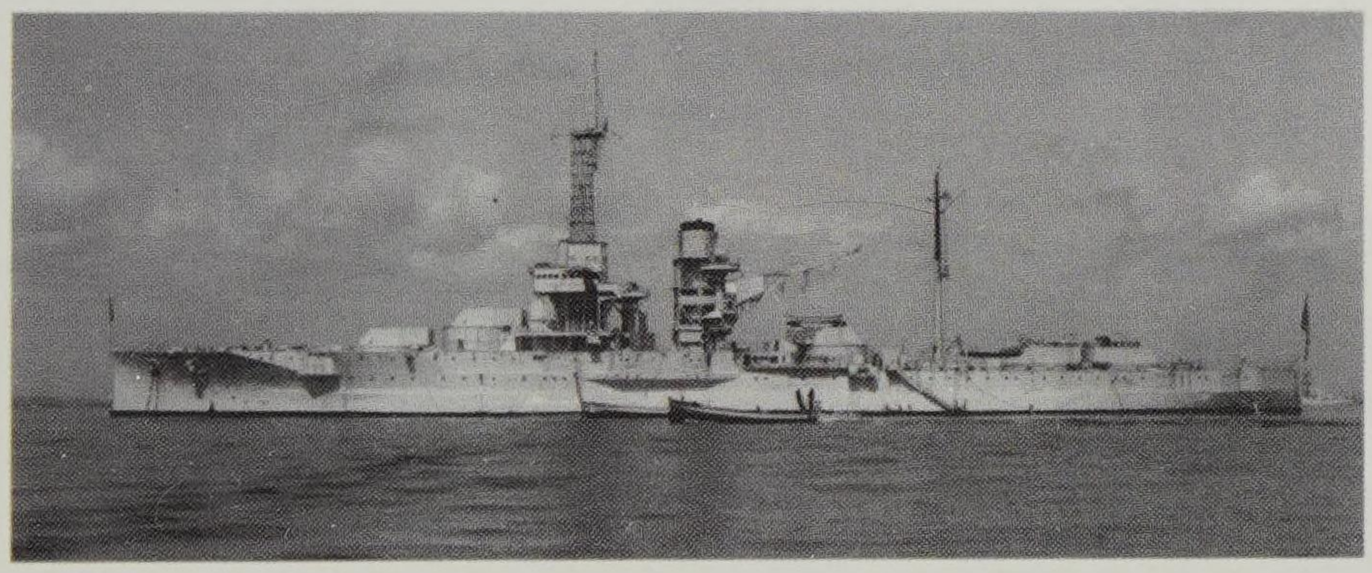
Builders Yard	New York Shipbuilding Co Camden NJ
Modernizing Yard	Boston NSY 1926-28
AG Conversion Yard	Norfolk NSY 1931/32
Scrapping Yard	Pearl Harbor NS
Memorial Location	Pearl Harbor HI

Ordered	Keel Laid	Launched	1st Comm
1908	15 Mar 1909	12 Dec1910	31 Aug 1911
Decom BB	Comm AG	Trfr Reserve	Decom
21 May 1930	1 Jul 1931	29 Dec 1941	15 Sep 1944
Stricken	Dedicated		
13 Nov 1944	27 May 1972		

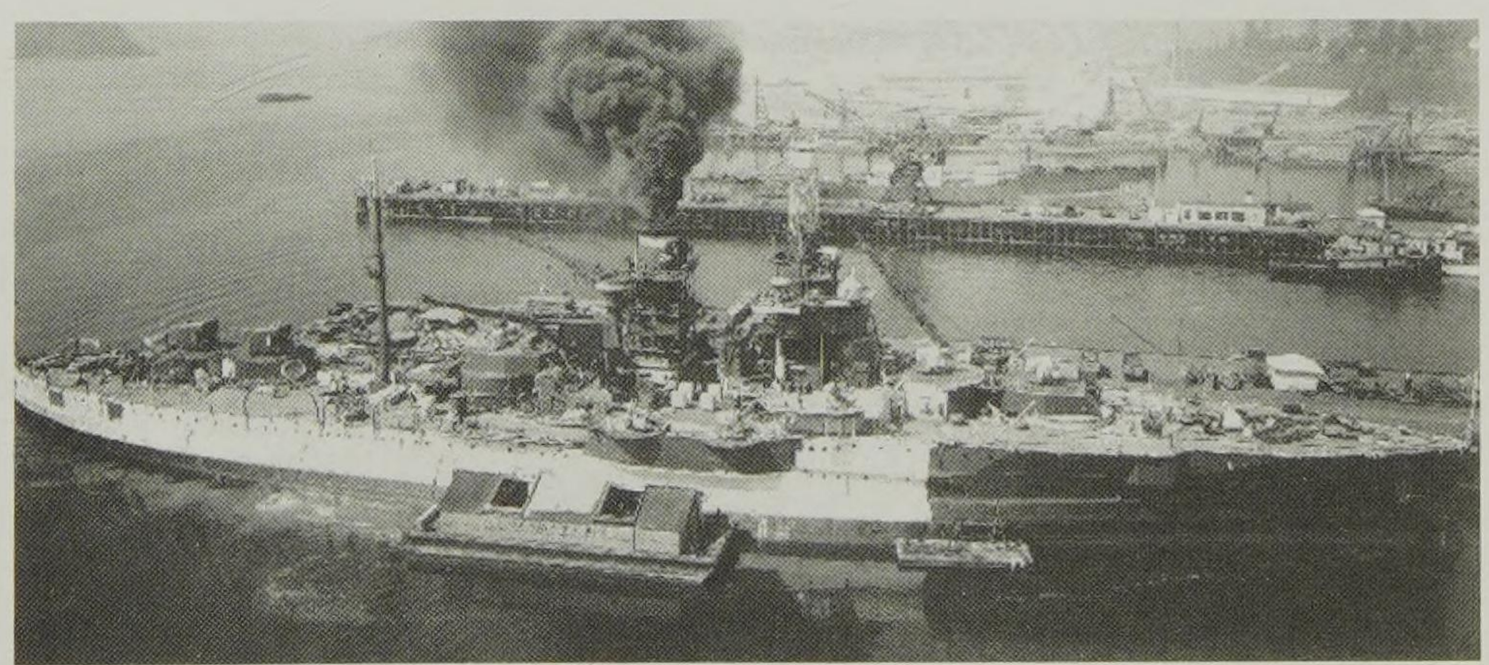
Active Service Years: 30.0 yrs



USS Utah AG16 (ex-BB31) target ship Pearl Harbor Oahu HI. 7 Dec 1941. Utah was moored on the east side of Ford Island in the berth normally assigned to the aircraft carrier USS Enterprise CV6. As Utah had recently returned from scheduled target practice duty the preceding week, the ship was still rigged as a live fire target ship. Which meant Utah had all armament and directors enclosed behind protective shields (dog houses) and the large timbers, used to cover the deck, stacked longintunal on the main deck amidships aft of the port boat crane ready to be off loaded to a barge scheduled for 0805. Utah was struck by the first of two torpedoes at 0758 during morning colors scheduled for 0800 sharp. The painting portrays this first strike on the Utah. This torpedo strike on Utah was the first hit on a US ship during the attack. A second Nakajima B5N 'Kate' torpedo bomber from the carrier Hiryu having just released what will be the second torpedo to strike flashes over the "Morning Colors Detail" assembled on the fantail above where the National Ensign is half way up the flagstaff. Utah capsized with her colors still at half mast.



Circa 1935 AG16 San Pedro CA. With all 6 empty main turret housings in place. Paint is Ms3, Pearl Mist Gray commonly known as "Prewar White". Note the heavy radio aerials between the foremast and the mainmast Also notice the resemblance to the early war configuration of the USS Arkansas BB33. AG16 and AG17 were demilitarized by the USN to comply with the terms of the Washington Naval Treaty. Japan also demilitarized the BB Hiei as an AG but returned the ship to service as a BB prior to WWII. USN photo by George Winstead.



21 Aug 1941 Puget Sound NSY. AG16 under final overhaul. Note the open 5"/25 single mounts on barbette 2 and turret housing 1. Note the open 5"/25's amidships and enclosed 5"/38 single mounts aft atop turret housings 4 and 5. The ship is being painted into Ms1. Turret 3 housing has been retained. Also note the large cranes, used for handling ships boats and the large timbers installed on the main deck when AG16 was configured as a target ship. The unique searchlight array abaft the stack was also carried by the BB30.

Wyoming Class: 2 Battleships of 1909

USS Wyoming AG 17 (BB 32) USS Arkansas BB 33

An incrementally improved Florida class, with an increased in the main turret count to 6, the USN's maximum. The BB32's also completed with 2 stacks, 2 cagemasts, as coal burners, and were also fitted with reciprocating engineering plants. Both ships were rebuilt in the late 1920's with a single funnel and cagemast forward, short tripod aft and converted to oil fuel. In 1932 BB32 was converted into a gunnery training ship, and was officially redesignated as a Miscellaneous Auxiliary (AG17). Main battery turrets 3, 4, and 5 removed. An asymmetrical mixed caliber AA battery for training purposes was also fitted. In 1944 all remaining main battery turrets removed replaced with 5"/38 twin mounts on turret barbettes for turret 1, 2, 6 and on the stbd side abaft of the stack. AG17 was further modified to an Anti Aircraft Warfare Development ship early in 1945 with the forward cagemast removed and replaced with a pole mast top by an SG search radar. The external waterline main armor belt was also removed. During the ship's training career a multitude of various types and calibers 20mm/40mm, 3"/50, 5"/38 single mounts AA guns were laid out asymmetrically on the 02 level. In 1944 3 Mk37/Mk4 fire control directors were also added 2 abaft the bridge, 1 atop barbette 4. AG17 was decommissioned in 1947, her crew and light equipment transferred to USS Mississippi AG128 (ex-BB41). Which had assumed the role of the USN's gunnery development ship. AG17 was stricken, and scrapped in 1947.

In July 1942 BB33 was modernized when the forward cagemast was replaced with a tripod mast with a fighting top. The AA battery was augmented with the addition 4 open mount 3"/50 AA guns and a multitude of 40mm/20mm mounts. In Sep 1944 the bridge size was increased and the light AA armament was again upgraded with the addition of more 20mm mounts, and the anchor hawse pipe bulges, unique to BB33 were removed, and replaced with standard hawse pipes. In 1945 2 Mk50/Mk10 fire control directors for the 3"/50 AA battery were added. One Mk50 was mounted atop the bridge structure and the 2nd atop the aft tripod. Main battery Fire Control was provided by Mk3 radars 1942-1945.

BB33 placed in reserve in Oct 1945 and was scheduled for immediate disposal. BB33 subsequently was designated as a target ship for Operation Crossroads. BB33 survived the first airdrop test (Shot Able). But during the sub surface test (Shot Baker), was literally picked completely up out of the water by the rising water column and into the side of the blast cloud, the ship then dropped back to the surface of the water, whereupon BB33 immediately sank.

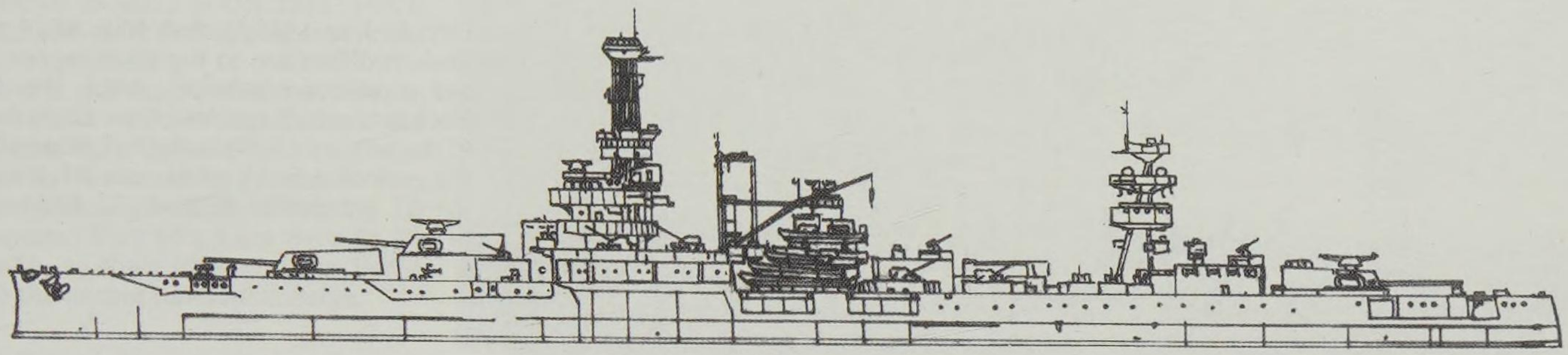
Wyoming Class Battleship and Gunnery Ship Statistics

Displacement		Std/FL Designed		27,900 tons/ 29,033 tons
		Std as AG		19,700 tons
Dimensions		Length WL/OA/Beam		555'0"/562'0"/106' 3"(1935)
		Beam as AG		93'3"
		Draught (max)		28' 6"
Machinery		Type		4 Parsons Geared Turbines
		Boilers as mod/ As AG		4/3 White Foster oil fired
		Shafts/designed SHP		2 shafts 43,187 shp nominal
		Rudder		single
		Max Designed Speed		21.0 knts/AG 17 18.0 kns
		Fuel bunkerage/Range		3,786 tons/7220 nm @12 kns
		Tactical Diameter		640 yds @ 21 kns
		GM		4.01
AG17	Armament	Main	AG 1941/1945	6-12"/45/14-5"/38
		Sec	AG 1941/1945	4-3"/50
		AA	AG 1941	4-3"/50 8-.1.1"
			AG 1945	12-40mm
		Lt. AA	AG 1941/1945	8-.50 cal /8-20mm
BB33	Armament	Weight of Broadside		10,400lbs/5.2tons
		Projectile Weight		866lbs/0.4335tons
		Max range		23,500yds/13.35miles
		Rnds/weight per Min		2.0/10.4 tons
		Rnds per gun /Total Rnds		100/1,000
		Main	BB33	12-12"/45
		Sec	BB33 1943/45	16-5"/51/6-5"/51
		AA	BB33 1942-45	8-3"/50/ 10-3"/50
		Lt. AA	BB33 1945	32 -40mm
		MG AA BB 1942/45		12-20mm/18-20mm
Protection		Main (wl) Belt/incline		BB33 9-11" 8'/0° AG17 0"
		Deck		6.0"/3 decks
		Turret		12"face 3"side 8" top 1" back
		Total Armor Weight		2,216.94 tons
Catapults/Aircraft		BB33 1930-1946		1 cat/3 aircraft
		AG17 1932-1937		none

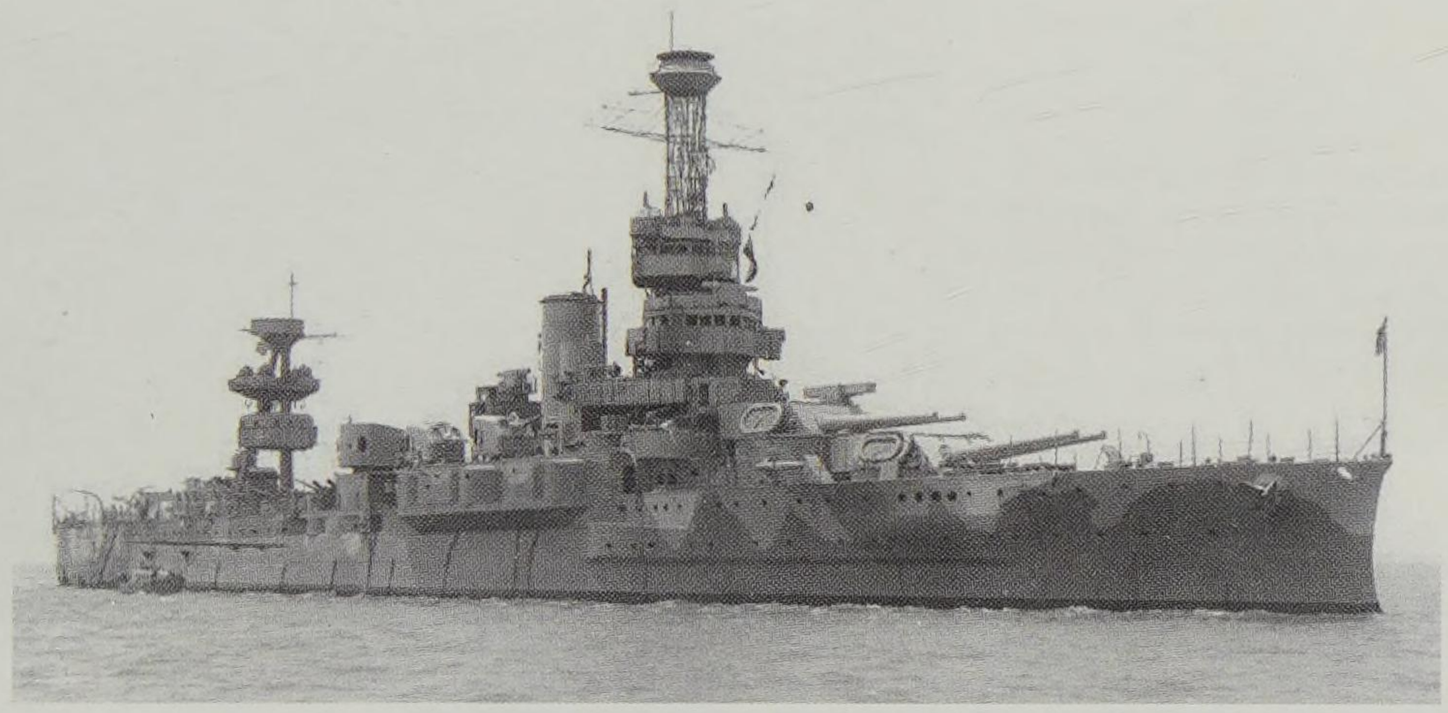
USS Wyoming AG17 (BB32) Call Letters: **NITR**

Builders Yard	Wm Cramp & Sons Philadelphia PA		
Modernizing Yard	Philadelphia NSY 1927		
AG Conversion Yard	Philadelphia NSY 1931		
Modernizing Yard	Norfolk NSY 1944		
Scrapping Yard	Lipsett Inc Sparrows Point MD 1947		
Ordered	Keel Laid	Launched	1st Comm
14 Oct 1909	9 Feb 1910	25 May 1911	25 Sept 1913
Decom as BB	Comm as AG	Decom	Stricken
21 May 1930	1 Jul 1931	1 Aug 1947	16 Sep 1947
Sold	Scrap		
30 Oct 1947	5 Dec 1947		

Active Service Years: 33.9

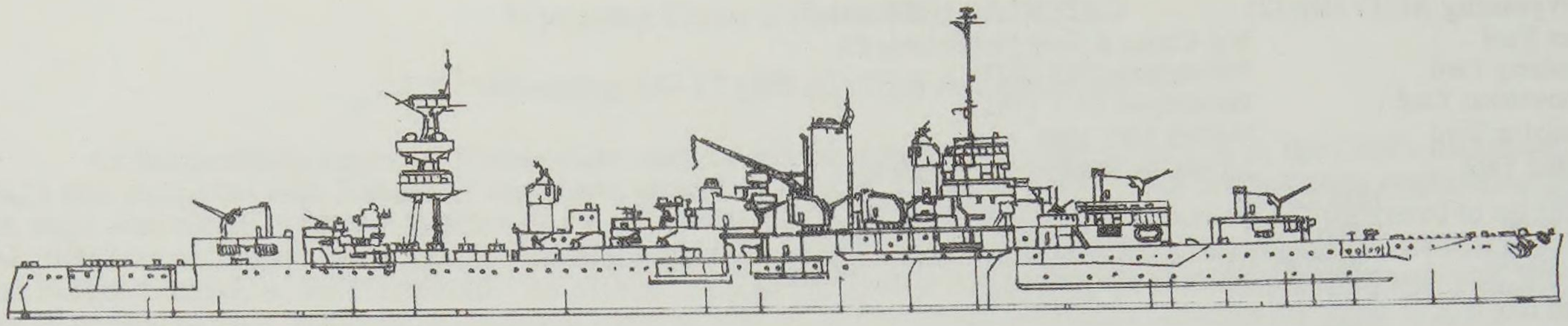


USS Wyoming AG 17 Jun 1942 Ms12

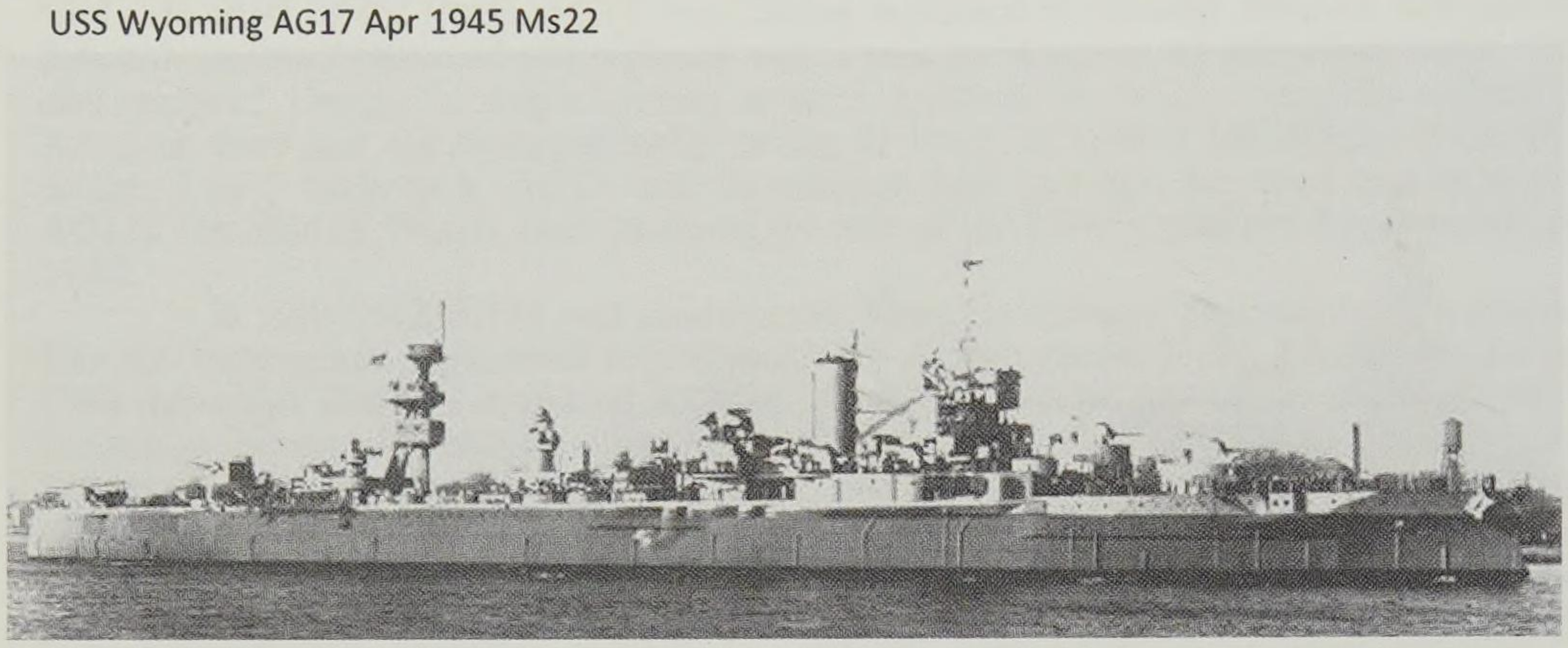


Left: 6 Jun 1942 AG17 anchored off Norfolk NSY. Note the cagemast, and the retention of main turrets 1, 2, 6, the asymmetrical array of AA guns which has been fitted amidships. Main turrets 1, 2, and 6 were replaced with twin 5"/38 mounts in Apr 1944. Note the plated over hull casemate positions. The ship is painted Ms12.

Right: Circa Apr 1944 Chesapeake Bay. AG17 after overhaul. Again note the asymmetrical amidships AA battery array .The 12" turrets have all been removed and replaced with 3 twin 5"/38 mount set in tubs mounted atop the barbettes. Note also the addition of a Mk37/Mk4 director amidships atop barbette 4 and the 2 Mk37/Mk4's in wing platforms abaft the bridge. The cagemast and after tripod have been retained.

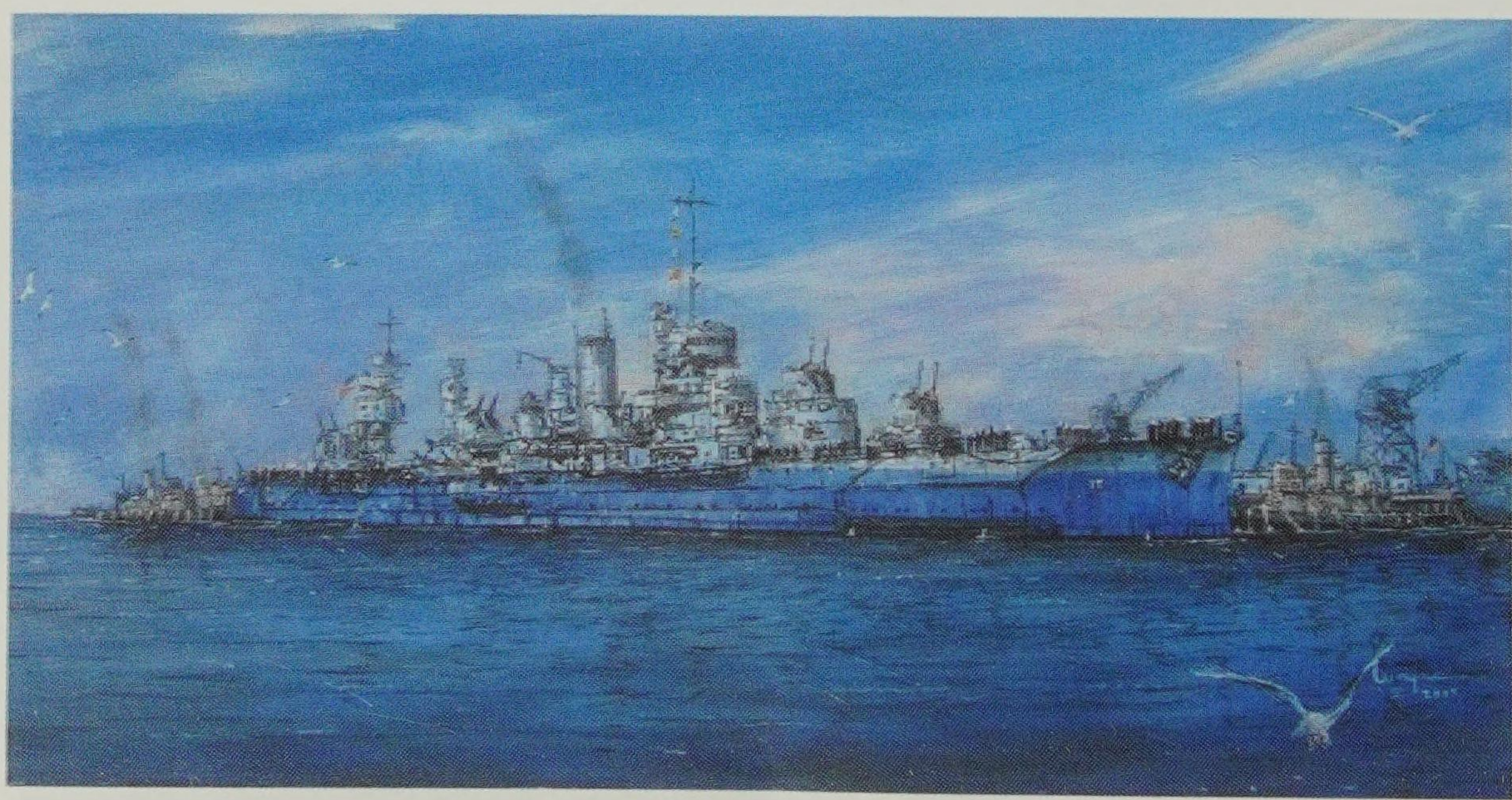


USS Wyoming AG17 Apr 1945 Ms22



Left: 31 Mar 1945 Norfolk NSY. AG17 after final modifications to the AA weapons test and evaluation mission. Note the high freeboard which resulted from the removal of the armor belt. Note the hull slope aft on the maindeck level, which was a feature of the 1st generation BB30 BB32 BB34 class ships.

Right: Circa Aug 1945. AG17 underway off the East Coast. Note the polemast which was added in Jun 1945, and twin 5"/38 mounts on barbettes 1 and 2. AG17 was at this time attached to TF69 and operated out of Casco Bay ME developing anti-Kamikaze weapons and tactics. AG17 was the Flagship of ADM WA Lee Commander of Battleships Pacific 1942-1944, whom was in charge of the AA improvement program. AG17 was painted Ms22 1943-1947.



USS Wyoming AG17 (BB32) Gunnery Training Ship, getting underway at the Norfolk Naval Station in 1945. AG17 made so many short AA gunnery training cruises in Chesapeake Bay that the ship acquire the nickname the "Chesapeake Raider". While performing her 5 years of AA training duties, Wyoming fired more AA ammunition than any other USN ship during WWII.

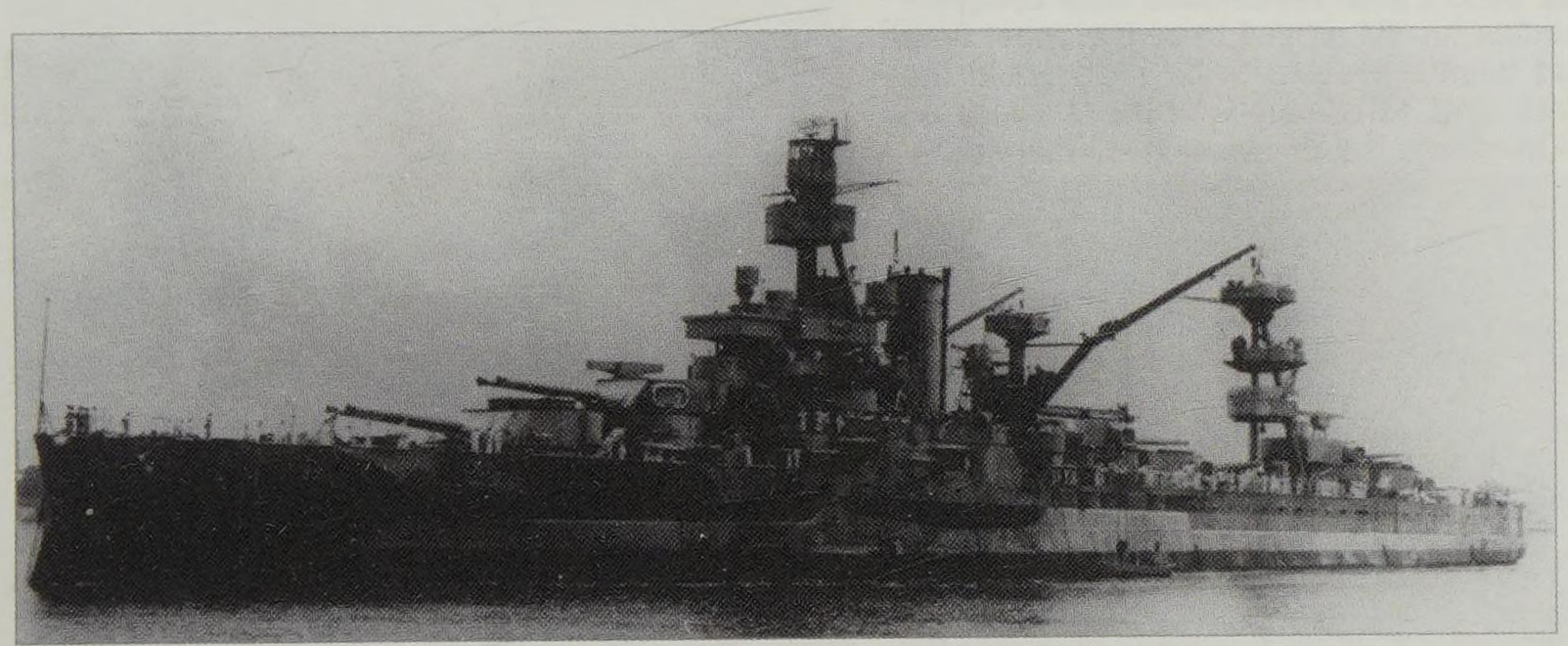
USS Arkansas BB33 Call Letters: **NACT**

Builders Yard	New York Ship Building Co. Camden NJ
Modernizing Yard	Philadelphia NSY 1925/26
Modernizing Yard	Norfolk NSY 1942
Modernizing Yard	Boston NSY 1944
Scrapping Yard	-

Ordered	Keel Laid	Launched	1st Comm
1 Aug 1907	16 Sep 1907	30 Oct 1910	17 Sep 1912
Sunk /Target	Decom	Stricken	
25 Jul 1946	29 Jul 1946	15 Aug 1946	

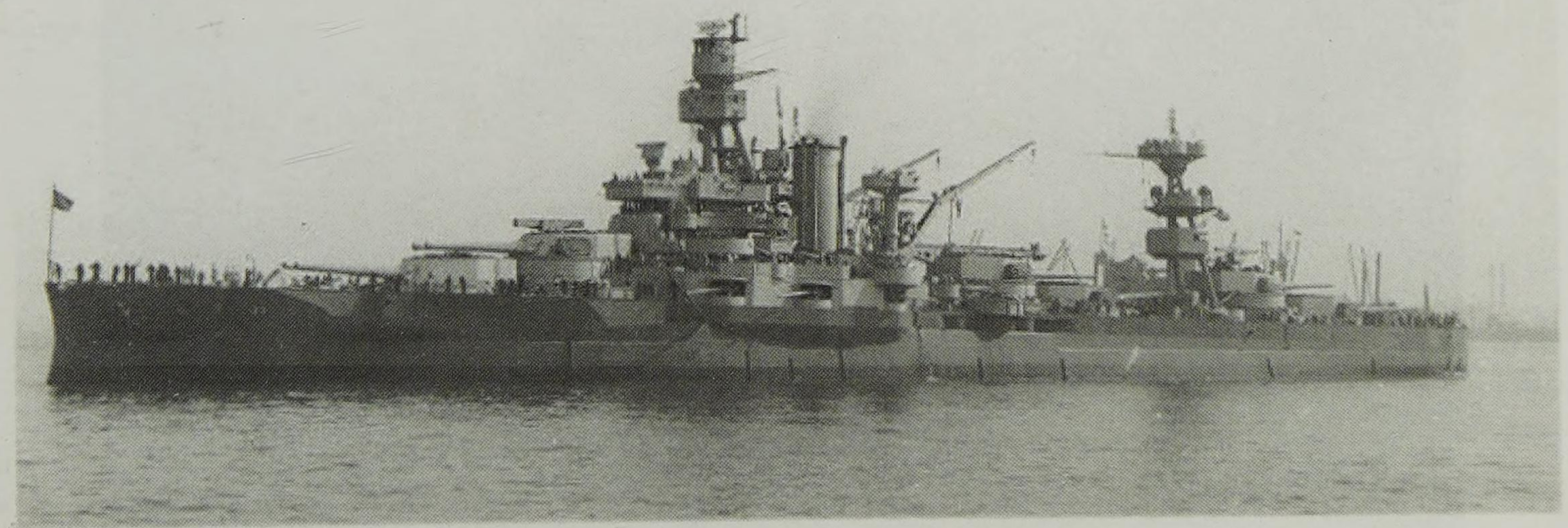
Active Service Life: 33.9 years

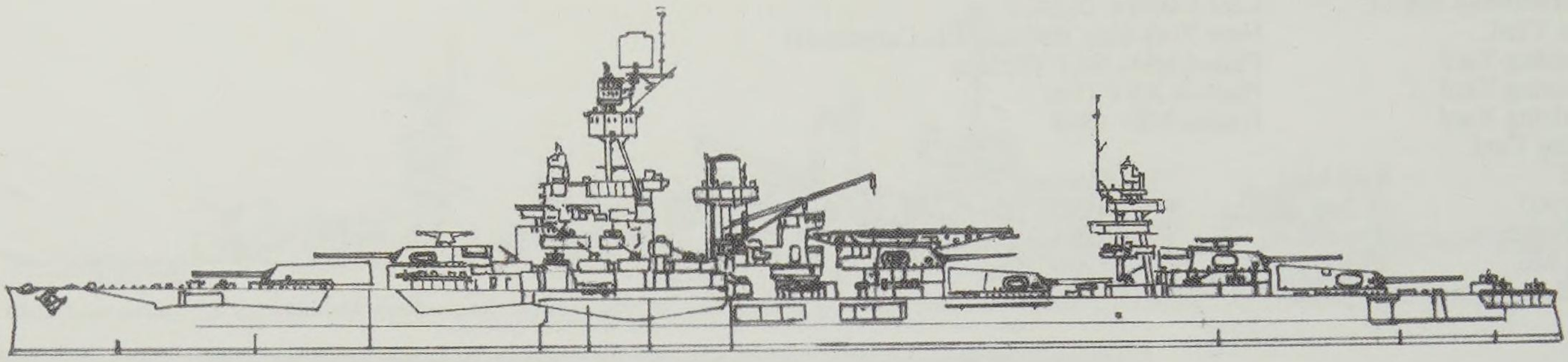
Right: Circa 1941 Hudson River New York Harbor. BB33 in Ms3 which was repainted to Ms12 in Oct 1941. This is the BB33's early war appearance, note the resemblance to AG16. The cagemast was replaced with a tripod in Feb 1942. Two rangefinders are mounted atop turret 5 and one atop turret 2. The amidships catapult atop turret 3 was a feature of all the 1st generation USN BB's from their 1920's rebuilds to their disposal after WWII. Note the anchor hawsepipe bulge.



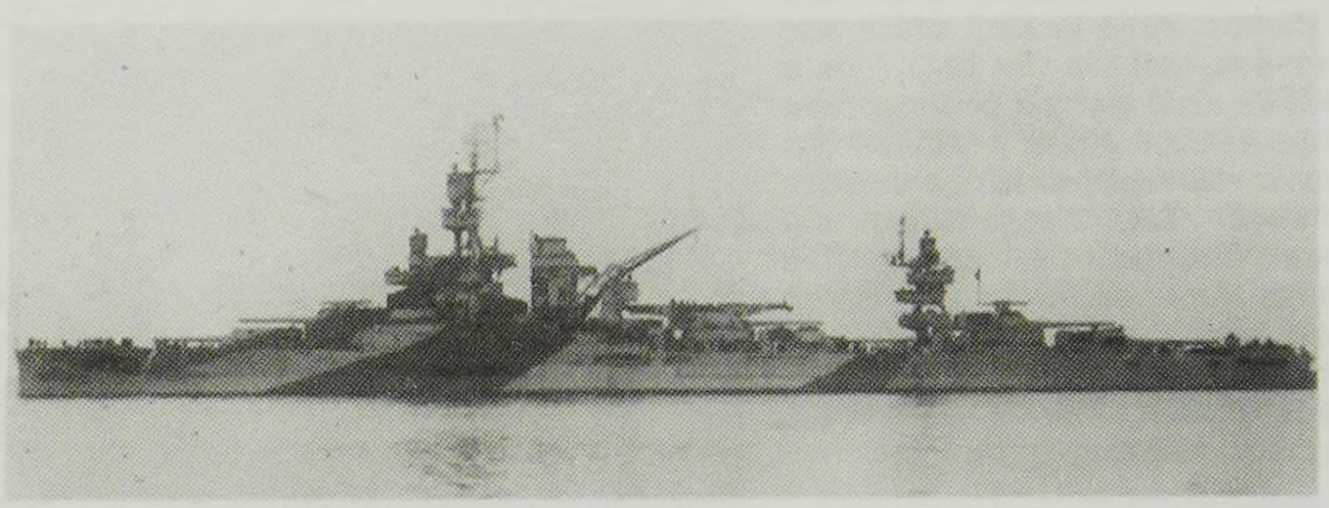
Left: Jun 1942 Norfolk NSY VA. BB33 arriving for an upkeep yard period. Note the faded Ms12 (modified) camouflage pattern. While escorting convoys in the early phases of the Battle of the Atlantic the 1st generation USN and 2nd generation UK BB's formed an effective deterrent to attacks by German Surface Raiders and Q-ships also known as decoy ships which were auxiliary cruisers disguised as unarmed merchant ships.

Below: 23 Sep 1942 East River off the New York NSY. BB33 after the ship's second wartime refit. Note the retention of the Mk3 radar forward, and the rangefinders atop turrets 2 and 5. An SC set has been added atop the after tripod. Paint is Ms22 which follows the aft sloping maindeck line rather than being parallel to the waterline. Note the extended anchor hawsepipe bulges have been retained.



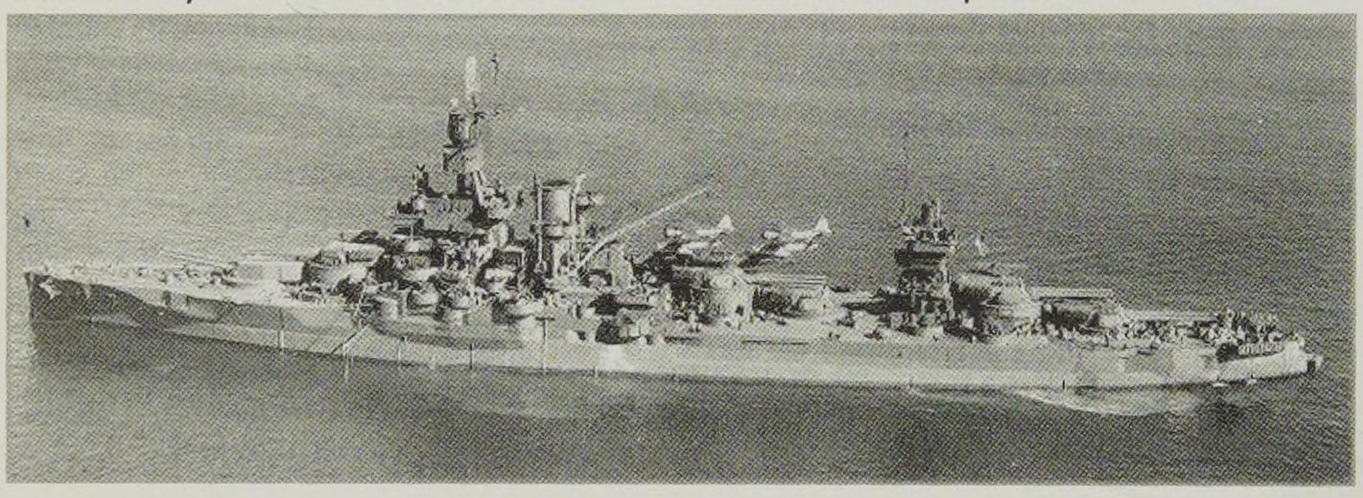


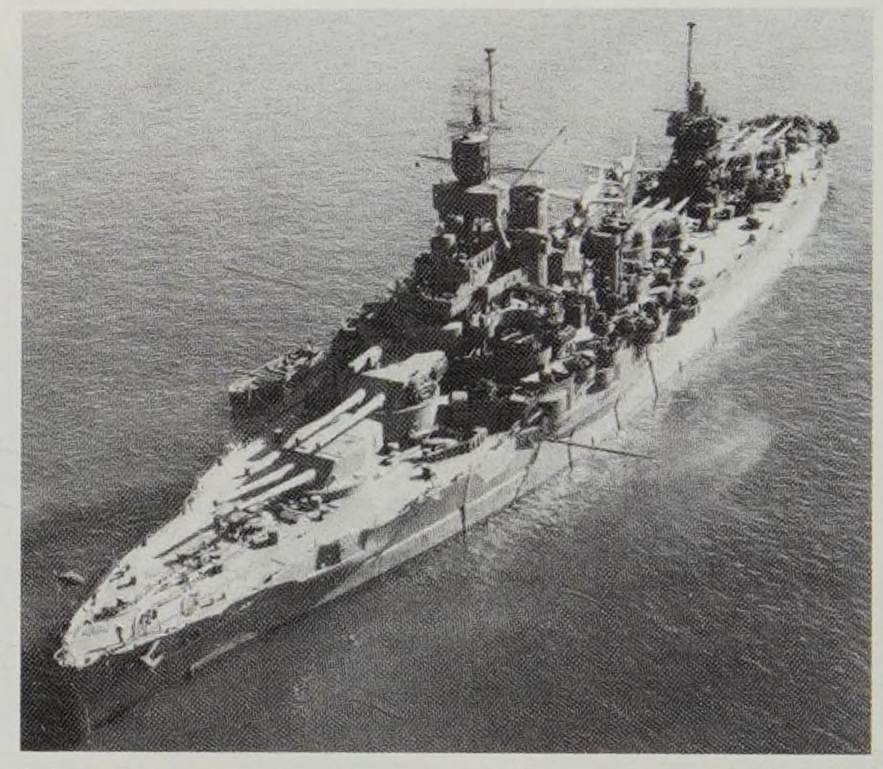
USS Arkansas BB33 Nov 1944 Ms32/7b



5 Nov 1945 off Boston NSY. BB33 in Ms33/7b. Note the Mk50 Directors that have been added, mounted 1 atop the bridge and 1 on the after tripod fitted to increase the accuracy of the 3"/50 AA battery. BB33-35 were the only USN BB's with 3"/50 heavy AA batteries and the only equipped with Mk50/Mk10 directors.

Below and Right: 1 Jan 1945 San Pedro CA. BB33's final appearance note complete lack of hull portholes. Paint is Ms21. 6 centerline turrets proved to be the upper limit turret count for USN BB designs. BB33 had been scheduled to be replaced in the battleline by the North Carolina BB55 in late 1941 to comply with the Washington Naval Treaty. But with the outbreak of WWII imminent the ship remained in service.





Below: Apr 1945 USS Arkansas BB33 off the landing beaches at Okinawa providing precision fire support to the assault forces. LVT2's headed for what was to be an unopposed landing. The USN suffered more ship damage and personnel causalities at Okinawa that in all other actions in WWII combined. Damage that was primarily inflicted by massed Kamikaze attacks.

New York Class: 2 Battleships of 1910:

USS New York BB 34 USS Texas BB 35

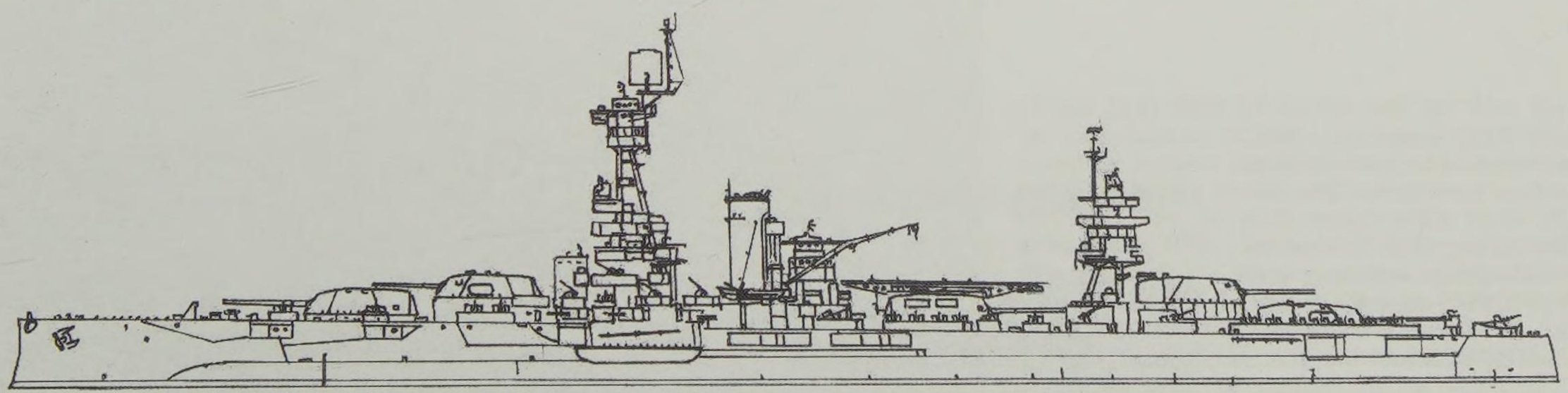
The last of the USN's 1st generation BB's. The BB34 class introduced the 14" gun caliber to the USN. The BB34 class were the last design of USN BB's to be completed as coal burners and like the BB32 class fitted 2 stacks and 2 cagemasts. These ships also introduced the geared turbine engineering plant to the USN. Both ships were rebuilt late 1920's with a single funnel and tripod mast forward, a short tripod aft, and converted to oil fuel. And, as with the BB30 and BB32 class elevation of the main battery was increase from 15° to 30°. In December 1938 BB35 became the first USN BB to be equipped with radar, when an XAF set was added above the bridge, which was subsequently removed in 1939. In 1942 both ships received an increase in the light AA battery with the addition of 20mm/40mm mounts. Until Sep 1944 both ships operated in the European Theater. In late 1944 prior to the transfer of both ships to the Pacific Theater both ships were again overhauled and the light AA batteries were greatly augmented. SK and SG radars were added and a 3"/50 fire control director Mk50/Mk10 was fitted atop the tripod mainmast and the bridge. These ships were considered to be poor seaboats after their 1920's modernizations, with a tendency to roll heavily, be wet, and generally difficult to handle and maneuver.

BB34 was scheduled for disposal as soon as WWII ended, and was in Jul 1946 used as a target ship in Operation Crossroads. While the ship survived both tests, it was heavily contaminated with residual radiation. And after a study and evaluation period at Pearl Harbor the ship was sunk as a gunnery target southeast of Oahu Hawaii in 1948. Prior to BB34's sinking the state of New York expressed interest in acquiring the ship as a museum, but this was denied by the USN due to the difficulties involved in completely decontaminating the ship.

BB35 was decommissioned in Oct 1945 and scheduled for disposal. In early 1946 the state of Texas expressed interest in acquiring the ship as a museum. In Apr 1948 BB35 was towed to the San Jacinto Battleground of the Texas Mexican War of 1836. BB35 was permanently moored in special basin off the ship channel near Houston TX, and placed on public display. BB35 is the only surviving example of 1st generation dreadnought.

New York Class Battleships Statistics

Displacement	Std/FL 1945	27,500 ton/31,924.2 tons
Dimensions	Length WL/OA/Beam	565'0"/573'0"/106'0"
	Draught	28' 7/8" nominal
Machinery	Type:	4/Geared Turbines
	Boilers	6 oil fired 295 PSI
	Shafts/designed SHP	2 shafts /26,500 shp nominal
	Rudder	single
	Max Designed Speed	21.00 knts
	Weight of Eng Plnt	23,113 tons
	Fuel bunkerage/Range	2,824.6tons/8,000nm@10 kns
	Tactical Diameter	800 yds @ 19.0 kns
	GM	6.53
Armament	Weight of Broadside	15,000lbs/7.5tons
	Projectile Weight	2,000lbs/1.00tons
	Max range:	23,000yds/13.00miles
	Rnds/Weight per Min	3/22.5 tons
	Rnds per gun/ Total Rnds	100/1,200
	Main	10-14"/45
	Sec 1942-45	6-5"/51
	AA 1942-45	10-3"/50
	Lt. AA 1945	40-40mm 36 20mm
Protection	Main (wl) Belt/ Incline	13.5-8.0" vertical/0°
	Deck	5.5"/3 decks
	Turret	8"/16"face 5"side 10" top 9" back
	Armor Weight	As mod 10,030.7 tons
Catapults/Aircraft	1935-45	1 cat/2 aircraft

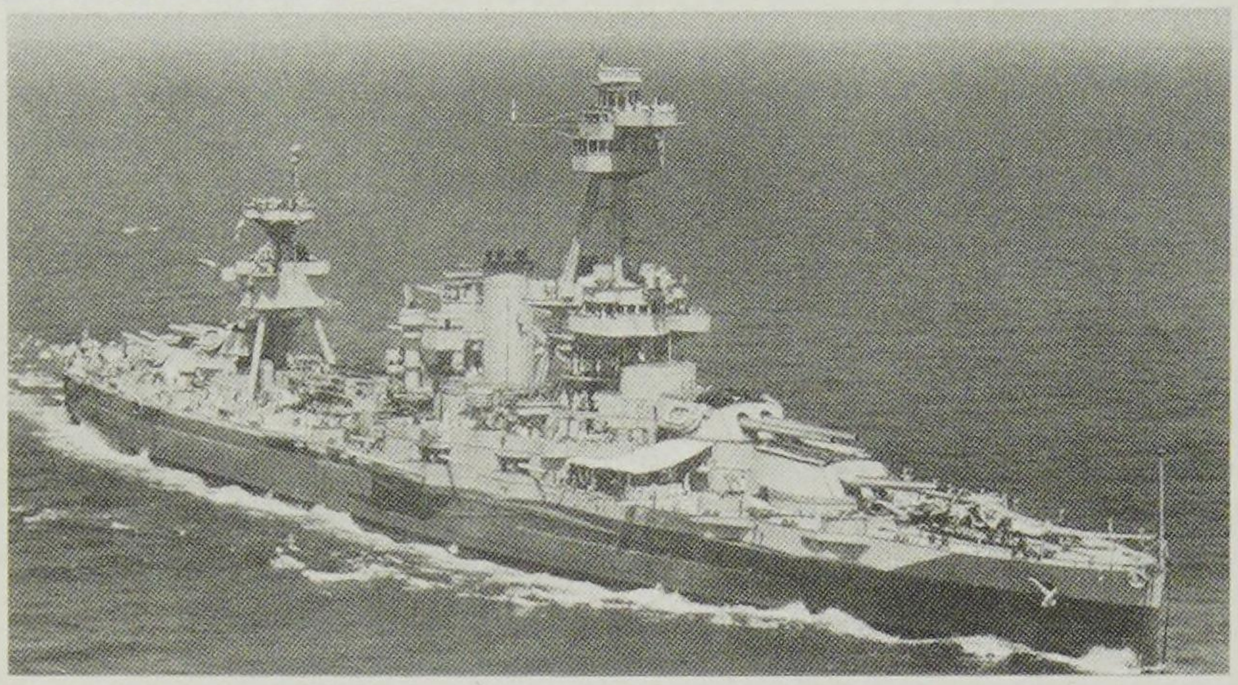


USS New York BB34 Nov 1944 Ms32/8b

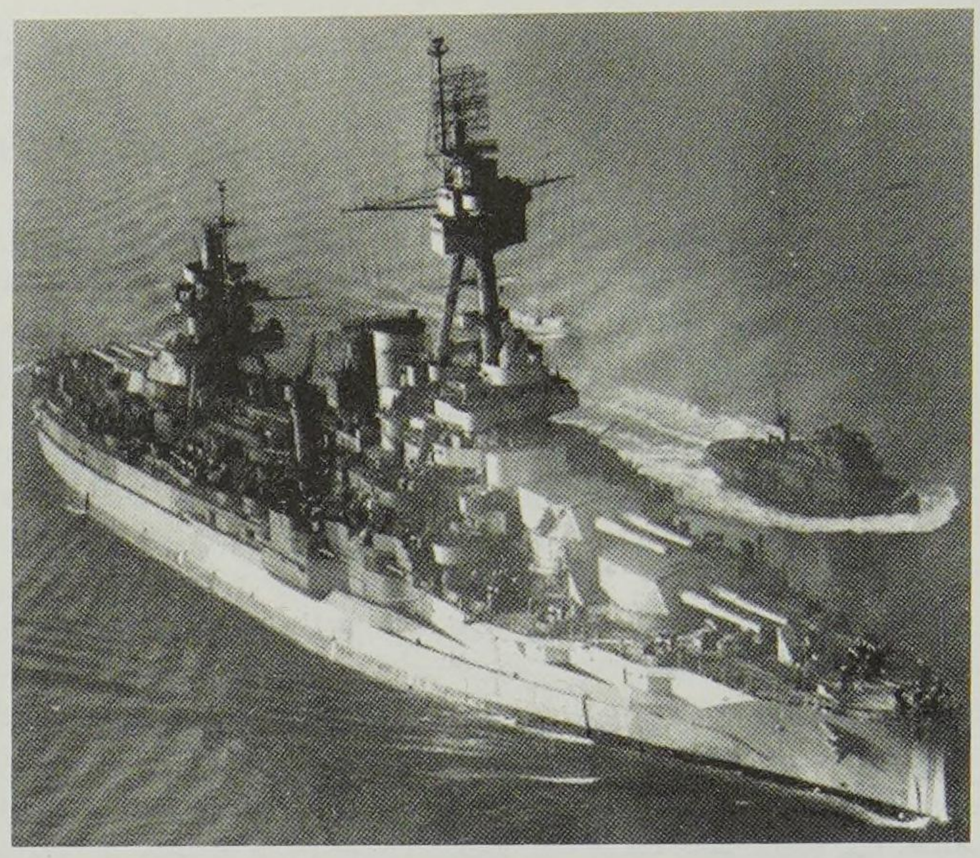
Battleship USS New York BB34 Call Letters: **NACT**

Builders Yard	New York Ship Building Co. Camden NJ		
Modernizing Yard	Norfolk NSY 1926/27		
Modernizing Yard	Norfolk NSY 1942		
Modernizing Yard	Boston NSY 1944		
Scrapping Yard	Sunk as Target 1946		
Ordered	Keel Laid	Launched	1st Comm
1 May 1911	11 Sep 1911	30 Oct 1912	15 Apr 1914
Sunk as Target	Decom	Stricken	
8 Jul 1948	29 Aug 1946	13 Jul 1948	

Active Service Years: 32.4



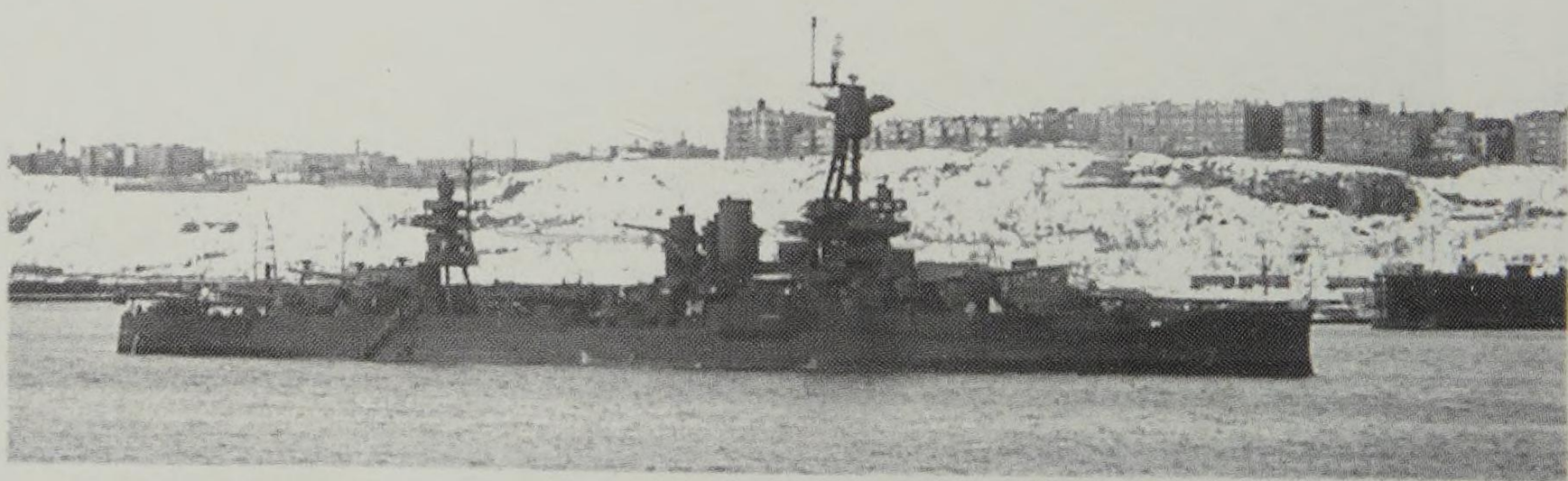
Above: Jun 1944 BB34 after supporting the landings during D Day operations.



Above: Norfolk NSY. BB34 after overhaul and AA upgrades prior to transferring to the Pacific Theater. The ship has received Mk50 directors for the 3"/50 AA battery, located one atop the bridge and one atop the after tripod mast. The ship is painted Ms31a/8b pattern which was also worn by BB35.

Nov 1944 USS New York BB34 Gillard's Cut Panama Canal Zone. After completion of duties in the European Theater, the New York is enroute to join the Pacific Fleet for the final operations against Japan in the last months of the war. The 112' width of the canal lock restricted USN BB beam designs to 110' until the 1943 rebuilds of the BB43 class and the BB67 class of 1940.

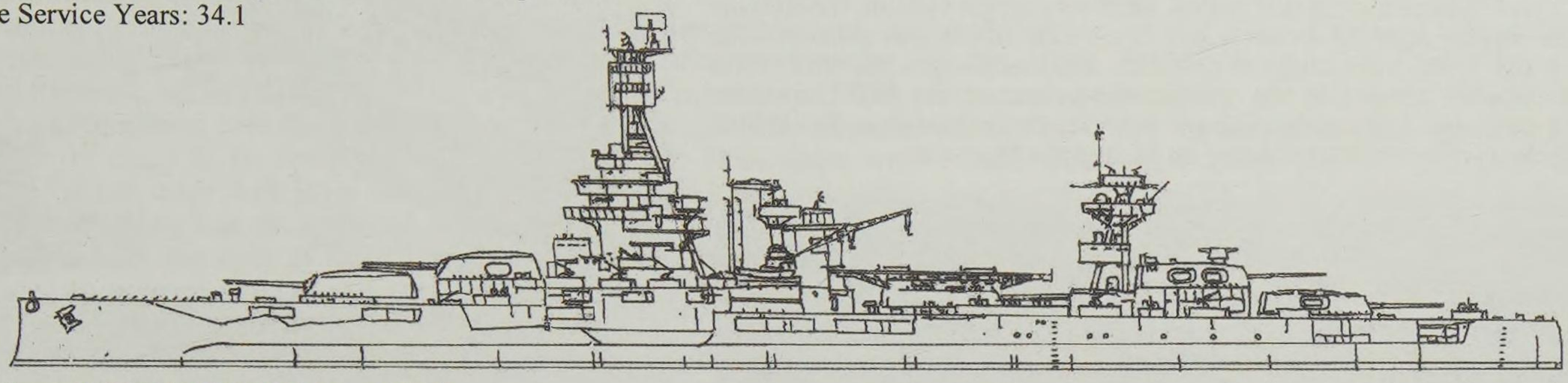
Left: USS New York BB34 anchored in the Hudson River in New York Harbor after the 27 Oct 1945 Navy Day Celebration and Presidential Review. BB34 was designated in Oct 1945 as a target ship for Operation Crossroads. Paint is Ms21.



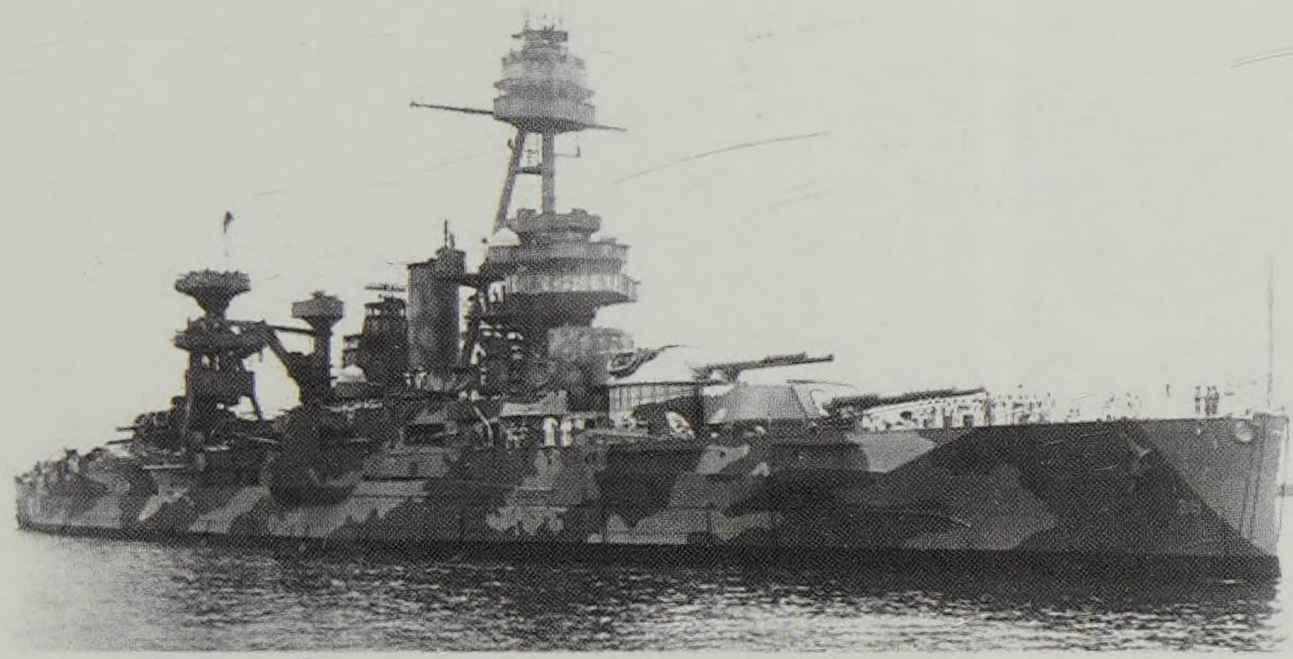
Battleship USS Texas BB35 Call Letters: **NACT**

Builders Yard	Newport News Shipbuilding. Norfolk VA		
Modernizing Yard	Norfolk NSY 1925/26		
Modernizing Yard	New York NSY 1944		
Scrapping Yard	-		
Museum Location	Houston TX 1948		
Ordered	Keel Laid	Launched	1st Comm
17 Dec 1910	17 Apr 1911	18 May 1912	12 Mar 1914
Decom	Arrived TX	Stricken	
27 Oct 1946	21 Apr 1948	30 Apr 1948	

Active Service Years: 34.1

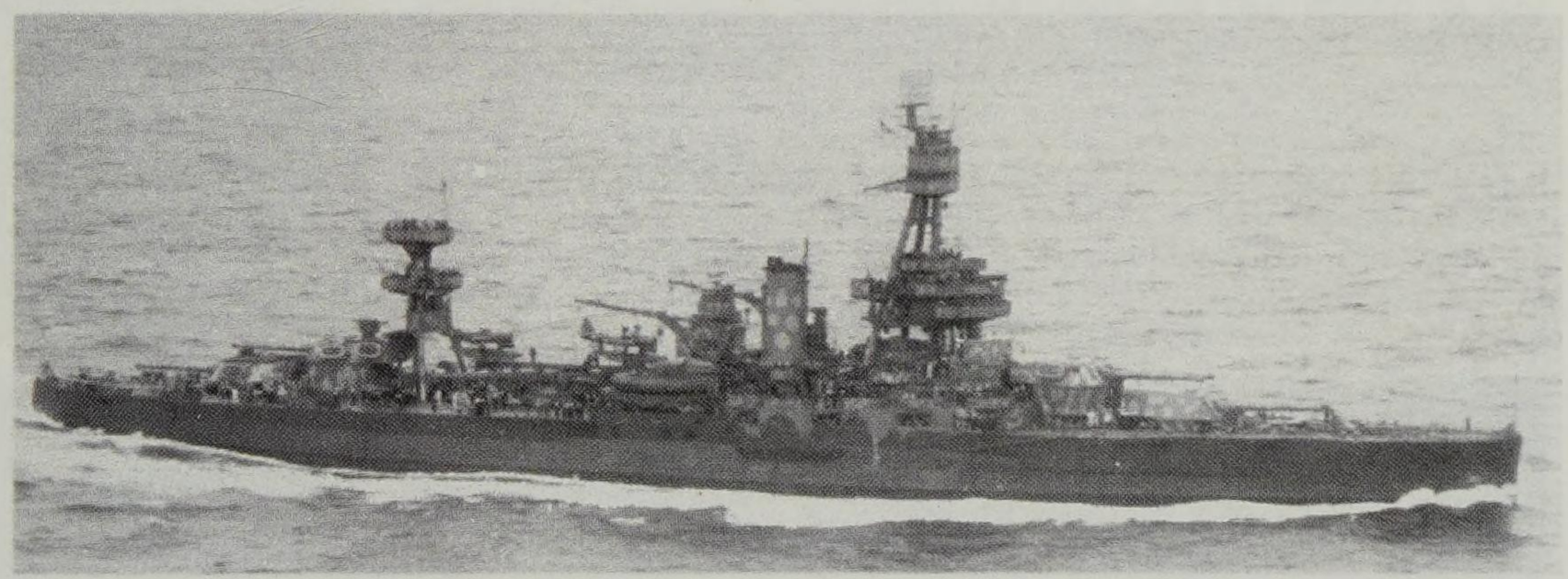


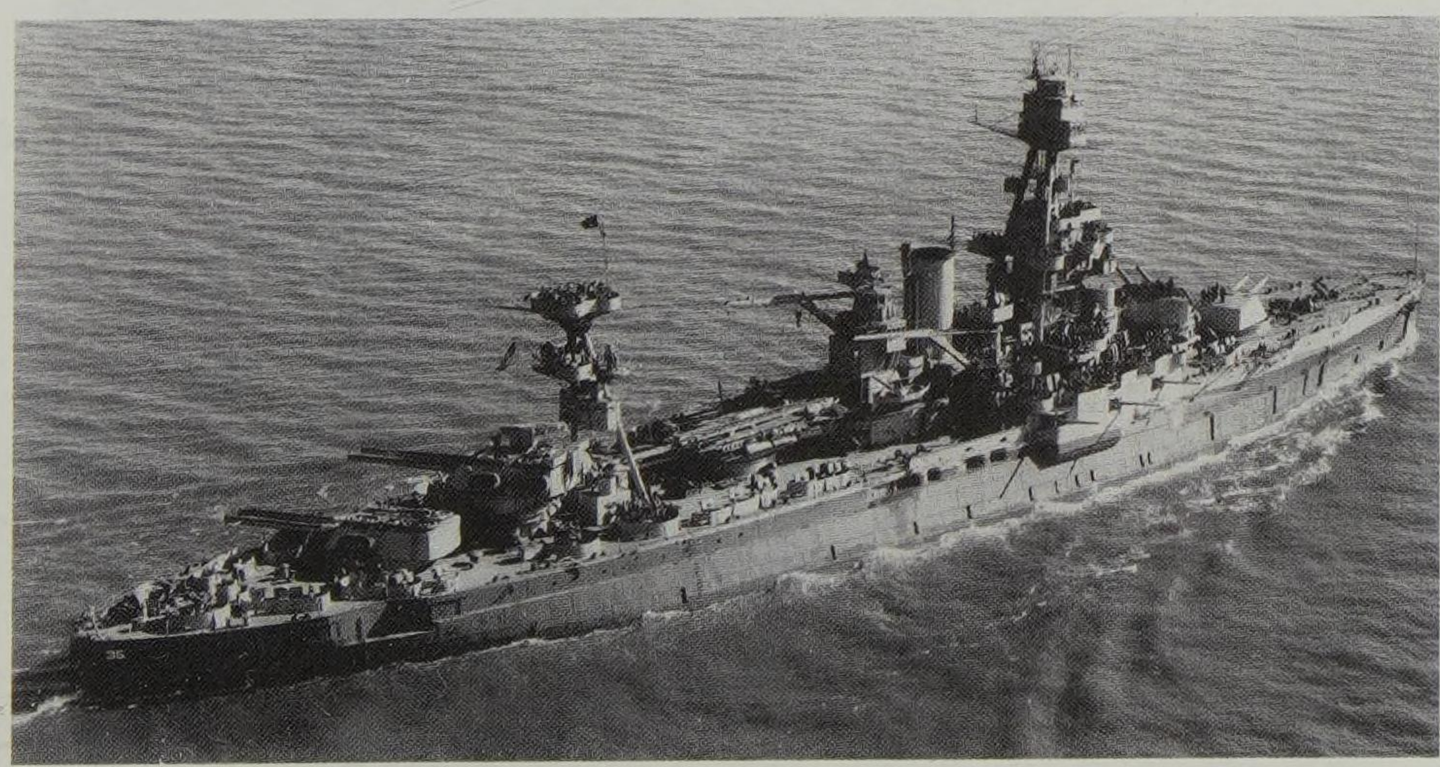
USS Texas BB35 Feb 1942 Ms12 (modified)



Left: 9 Aug 1942 BB35 Norfolk VA. The ship is painted Ms12 (modified). Note the unusual location of the hull number and the typical early 1942 minimal radar suite of 2 Mk3's and a foremast mounted CXAM1. Ms12 and Ms12 (modified) were used in both Theaters. But primarily in the Atlantic from late 1941 to late 1942, when they were largely by the Ms22 Graded Pattern as the "Atlantic Standard" 1943-1947.

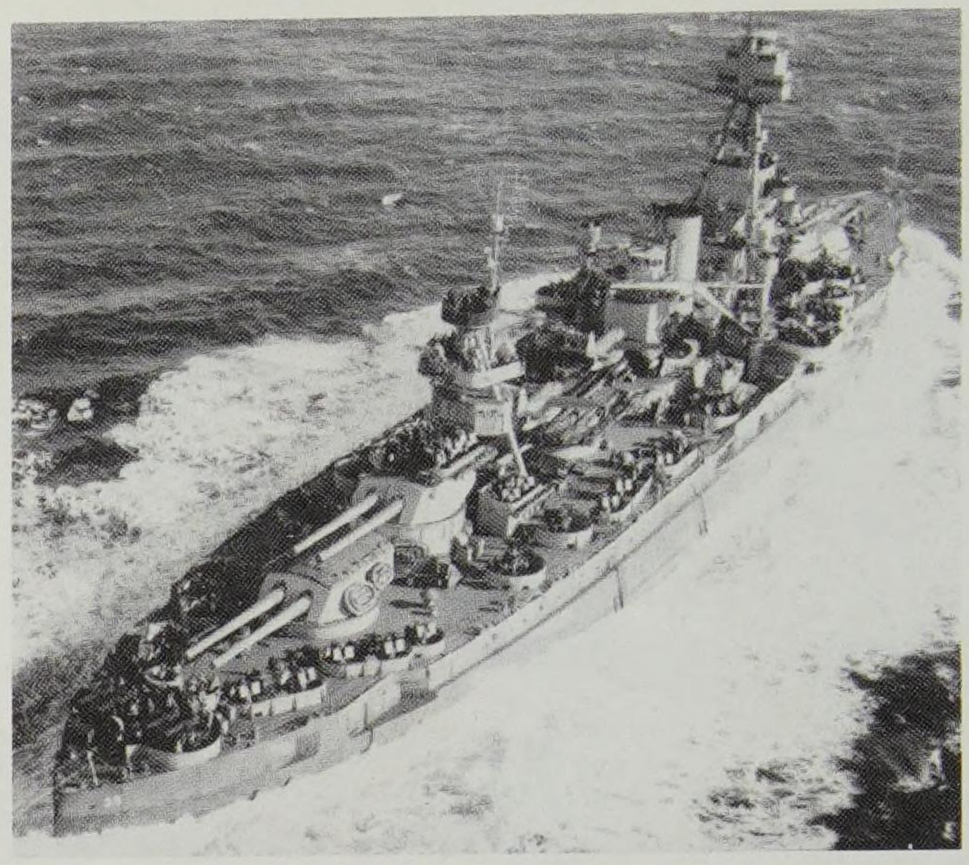
Right: off the East Coast. BB35 operating as Convoy Escort Note the Ms12 and the unique 'splotched pattern' applied to the stack. Note the CXAM set atop the foremast. dbc



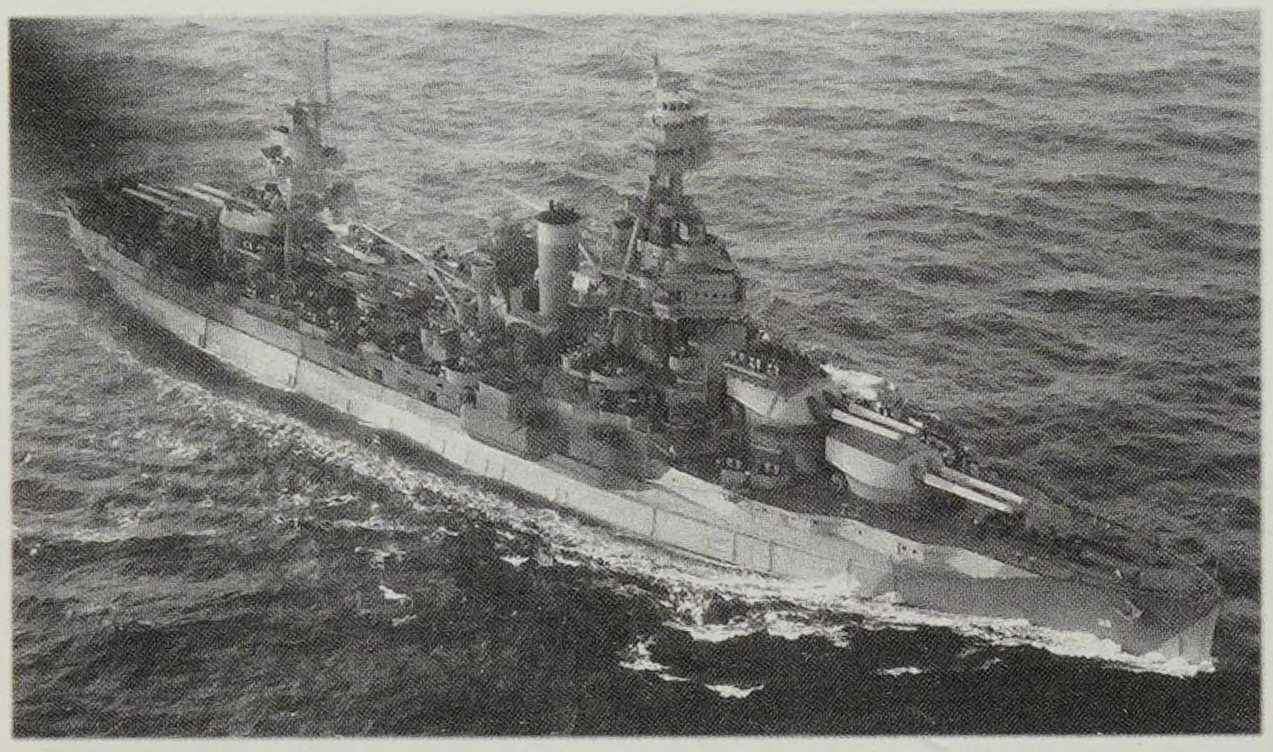


15 Mar 1943 BB35 off Norfolk NSY VA. With the 14" main battery trained to port and the 5"/51 casemate battery deployed. Note the torpedo blister along the hull line. The retention of the Mk3 radar atop the mainmast, and the tower aft of the stack. Note also the CXAM1 air search set atop the foremast. From 1941 to Sep 1944 BB35 operated in the European Theater. BB35 was overhauled in late 1944 and received the AA upgrades as in BB34, and was also repainted to Ms 32/8b prior to transferring to the Pacific Theater.

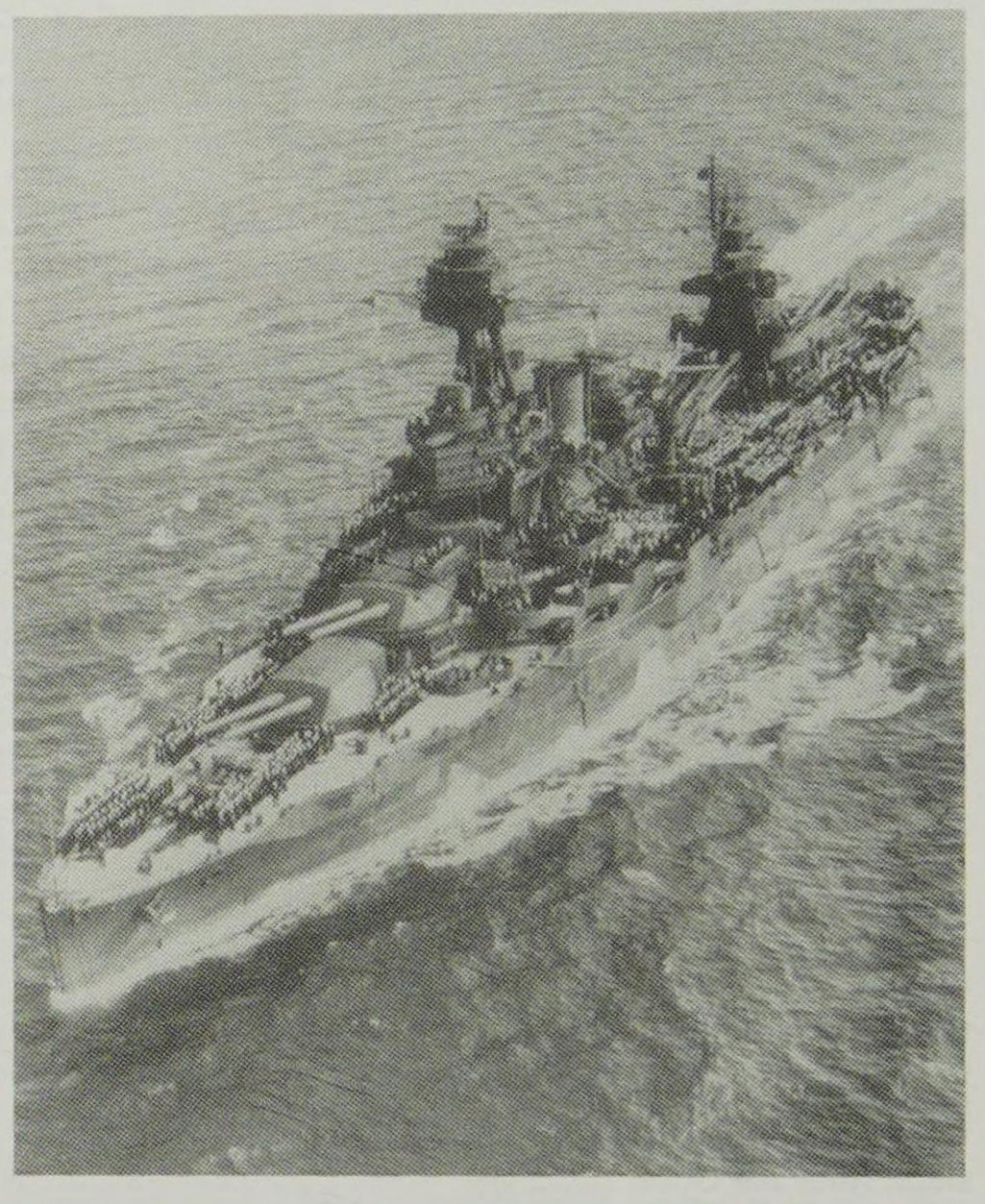
Right: 5 Jan 1944 off Boston NSY. BB35 returning from the European Theater enroute to overhaul at Boston NSY prior to transferring to the Pacific. Paint is the Ms22 BB35 wore from Dec 1942-Aug1944.



Below: 1 Nov 1944 of the coast of Maine. BB35 on post yard period shakedown. Note the massive light AA battery, and the 6 gun 20mm gun galleries atop turrets 3 and 4. The camouflage is Ms32/8b. BB35 exchanged the Ms32 for a Ms21 soon after arriving in the Pacific. BB34 retained the Ms32 until the Okinawa campaign. BB35 ended the war in Ms21. BB35 shipped an SK set atop the mainmast while the BB34 shipped an SK atop the foremast.



Right: 15 Oct 1945 off San Pedro Harbor. BB35 returning from a "Magic Carpet" operation with the crew and passengers standing by at quarters in Blues. Note the rounded sides and tops on the main turrets. A feature of all USN BB designs until the BB40 class which had flat side and top plate construction. Paint is now Ms21. AP photo.



Below: USS Texas BB35 on the East River in New York Harbor Feb 1942. BB35 is returning from an early war patrol off the Eastern Seaboard. One of the many such BB coastal patrols in the dark days of early 1942. The 1st generation battleships stood guard off the East Coast against unknown enemy forces at a time when everywhere Axis forces reigned supreme.

Nevada Class: 2 Battleships of 1911:

USS Nevada BB 36 USS Oklahoma BB 37

The world's first 2nd generation BB design. The design innovations of the protective systems, propulsion, and oil fuel systems introduced by the BB36 defined the characteristics of the 2nd generation of BB designs. When commissioned in 1916 BB36 was considered to be the most advanced BB in the world, and as such the USN took over the leadership of BB design, a position the USN retained until the end of BB construction in the late 1940's. The BB36 class also fitted the first USN triple main gun turrets, mounting 2 triple and 2 twins. This permitted retention of a 10 gun battery, while reducing turret count to 4. The lack of the amidships turret permitted the implementation of the concept of the "all or nothing" raft body armor protection scheme. This concept provided the thickest possible armor over the ship's vital equipment spaces, i.e. the main armament, magazines, and the engineering plant. The types of machinery plants differed between the two ships. BB36 was completed with direct drive geared turbines, while BB37 reverted to vertical triple expansion (VTE) reciprocating machinery, the last in a USN BB design. The ships completed with the secondary armament located in hull mounted casemates, with 1 stack, and 2 cagemasts. The BB36's were the 1st class to be completed as oil fueled ships. Both ships were rebuilt with tripod masts and the secondary battery relocated to the main deck level in the early 1930's. Main battery elevation was increased from 15° to 30°. Plans to retrofit BB37 with double acting four stroke diesel engines in 1925 were canceled due to physical size and weight considerations.

BB36 was sunk at Pearl Harbor after getting underway during the attack by 2 bombs, and 2 torpedoes. The ship was grounded to prevent sinking and was subsequently raised and given temporary repairs to pre-attack configuration. Initially the USN had not planned to modernize BB36. But in view of political considerations, in Feb-Dec 1942 BB36 received an extensive modernization. The after tripod mast, the amidships boat cluster, and heavy handling cranes were removed, as was the aircraft catapult from turret 3. The ship was fitted 16 DP 5"/38 in 8 twin mounts stepped on the 01/02 levels. The light AA battery was replaced with single 20mm and quad 40mm mounts. A small tripod mast topped by a main battery fire control tower was added aft. 4 Mk37/Mk4 DP directors in a 'diamond pattern' were fitted. The fighting top of the forward tripod was reduced. A raked extension was added to the after portion of the stack, and the searchlight platforms on the stack sides were removed. BB36 was the 1st sunken Pearl Harbor rebuilt BB to acquire what was to become the standard modernized 2nd generation 'pyramid style superstructure' silhouette.

Due to overall obsolescence BB36 was scheduled for disposal at the conclusion of WWII. BB36 was designated to participate as a target in Operation Crossroads in Oct 1945. Prior to the tests the ship was fitted with test instrumentation and at Bikini repainted into an overall International Orange color. This was done as the ship was designated as the "ground zero" aiming point for the air drop test (Shot Able). BB36 survived both test shots. But the ship was extremely radioactive, and after being stored at Kwajalein, BB36 was to be sunk off Oahu in Jul 1948 by gunfire from the BB Iowa, and 2 light cruisers, but they were unable to sink BB36. BB36 finally succumbed to 3 aerial torpedoes. BB36's atomic test ordeal and subsequent resistance to sinking was a testament to the survivability of USN BB designs.

BB37 was struck in rapid succession by 5-6 aerial torpedoes at Pearl Harbor, and capsized 135° to port in less than 10mins. In Jan 1942 the decision was made to salvage the ship to clear the mooring berth. BB37's superstructure, cranes, masts, and stack were removed during the righting and refloating salvage process in 1942/43. Temporary repairs made to the hull but due to BB37's heavily damaged hull condition, obsolete technology engineering plant, and general overall obsolescence, the decision was taken not rebuilt the ship. The hulk of BB37 was stored in the West Loch at Pearl Harbor until 1947. BB37 slipped the tow line, floundered and sunk northwest of Oahu while en route to the scrapper's yard on the West Coast.

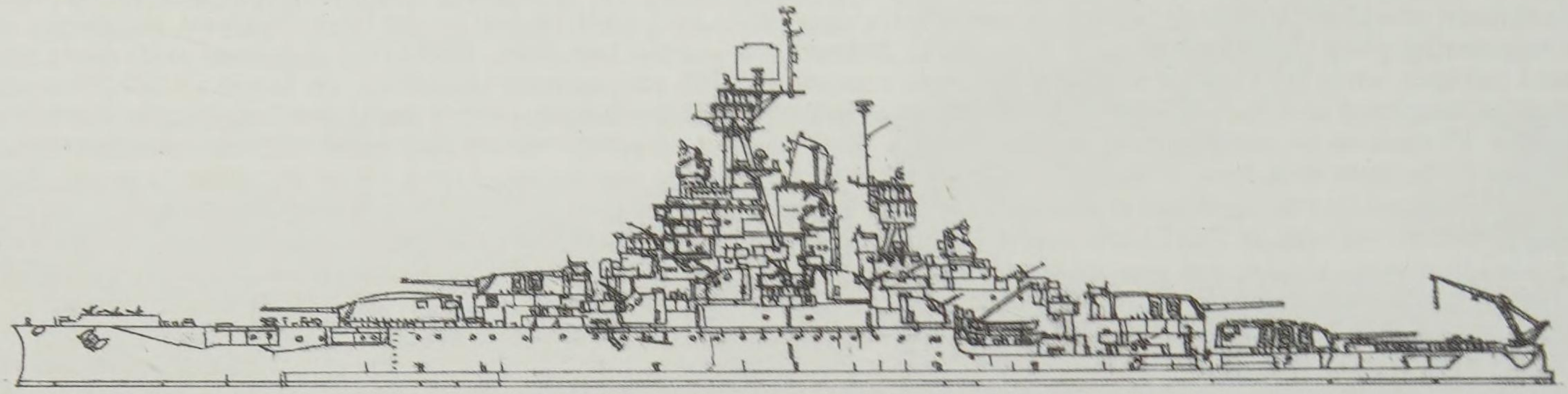
Nevada Class Battleships Statistics 1943

Displacement	Std/FL 1943	33,124.8 ton/35,548 tons
Dimensions	Length WL/OA/Beam	575' 0"/583' 0"/108'0"
	Draught	27' 6" nominal
Machinery	Type: BB36	4/Geared Turbines
	BB37	2-VTE Reciprocating
	Boilers	8 oil fired 295 PSI
	Shafts/designed SHP	BB36 2 shafts 26,500 shp
	Rudder	single
	Max Designed Speed	21.00 knts
	Weight of Eng Plnt	BB36 1860 tons
	Fuel bunkerage:	1,992 tons/8,000nm @10 kns
	Tactical Diameter	625 yds @ 20.0 kns
	GM	6.90
Armament	Weight of Broadside	15,000lbs/7.5tons
	Projectile Weight	2,000lbs/1.00tons
	Max range	23,000yds/13.00miles
	Rnds/Weight per Min	3/22.5 tons
	Rnds per gun/Total	100/1,000
	Main	10-14"/45
	Sec 1942/43	12-5"/51/16-5"/38
	AA 1942/45	8-5"/25/40 40mm
	Lt. AA 1942/45	4-3"/50/33 20mm
Protection	Main (wl) Belt/Incline	13.5-8.0" vertical /0°
	Deck:	5.02"/3 decks
	Turret:	18"/16"face 5"side 10" top 9" back
	Total Armor Weight	9,621.3 tons
Catapults/Aircraft	1941/45	2/1 cats 4/2 aircraft

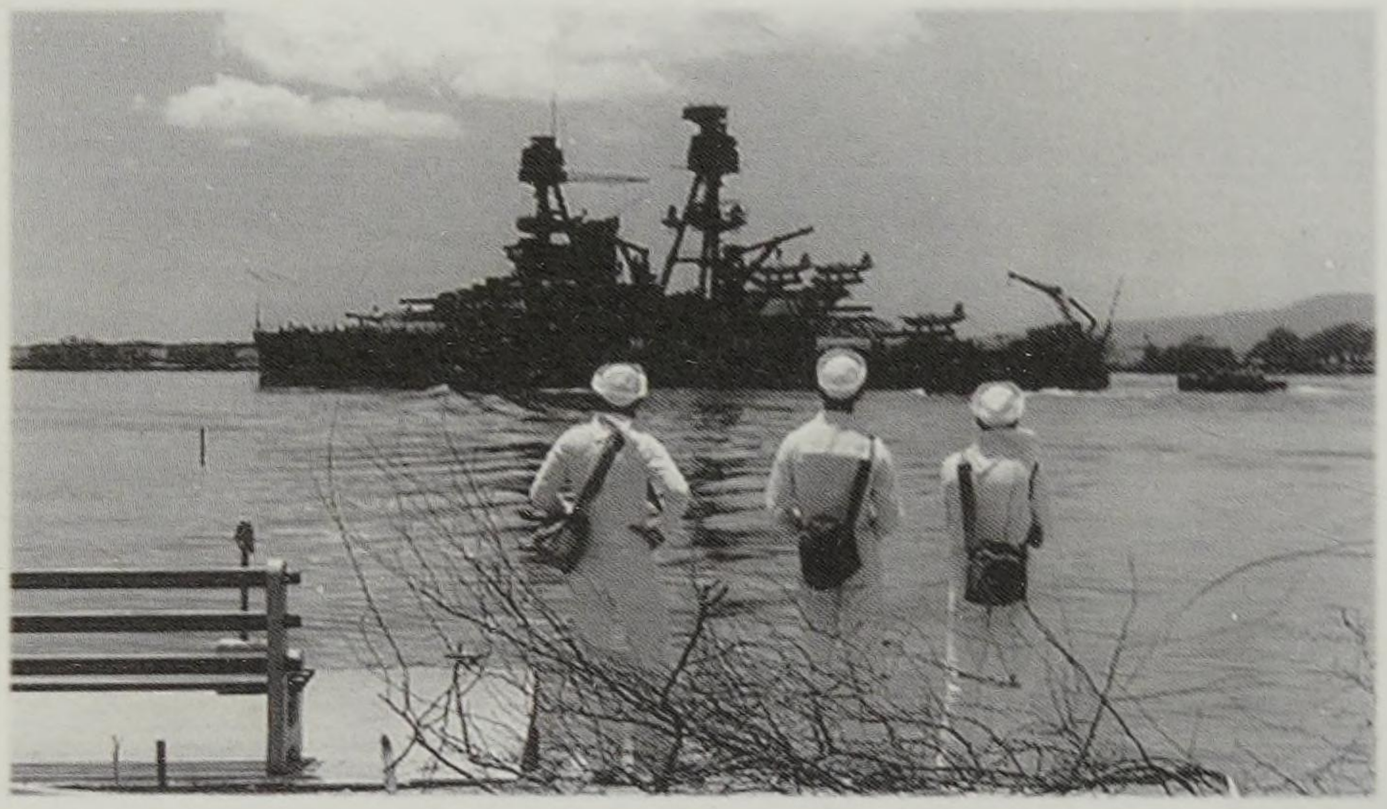
Battleship USS Nevada BB36 Call Letters: **NADK**

Builders Yard	Fore River Quincy MA		
Modernizing Yard	Norfolk NSY 1927/29		
Modernizing Yard	Bremerton NSY 1942		
Modernizing Yard	Bremerton NSY 1944		
Scrapping Yard	none		
Ordered	Keel Laid	Launched	1st Comm
22 Jan 1912	4 Nov 1912	11 Jul 1914	11 Mar 1916
Decom	Stricken	Sunk as Target	
29 Aug 1946	30 Oct 1946	31 Jul 1948	

Active Service Years: 30.5



USS Nevada BB36 Nov 1944 Ms32/6b

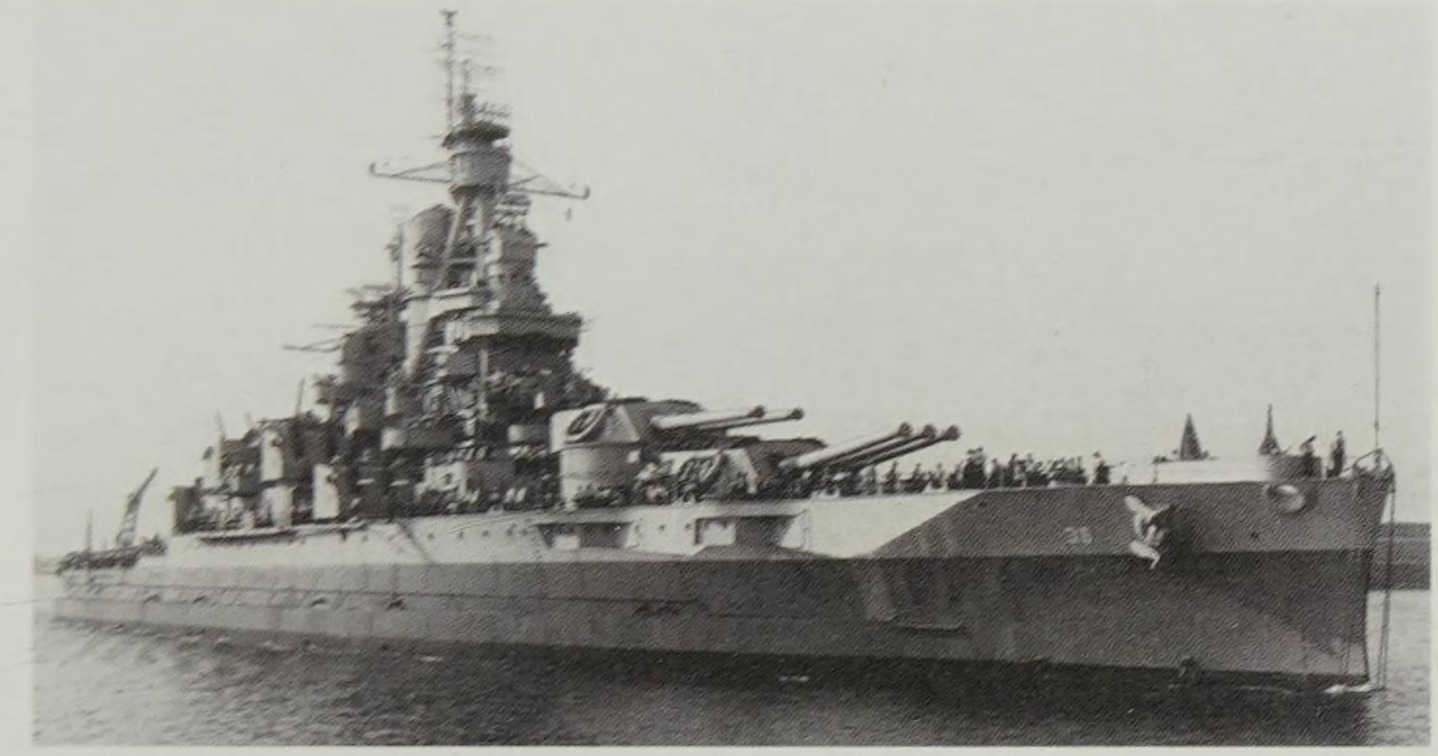


Left: 22 Apr 1942 Pearl Harbor. BB36 departs for Puget Sound NSY. BB36 was the 1st of the sunken BB's to be refloated and repaired. BB36 BB44 and BB48 all transited to Puget Sound NSY for modernization under their own power. Note BB36 has been restored to the ship's preattack configuration. Paint is Ms14.

Below: USS Nevada BB36 off Adak, Alaska, May 1943. Fresh from post Pearl Harbor repairs and modernization, Nevada is leading a sortie of the Attu Island amphibious assault forces. The ship is painted Ms11. Due to the harsh Arctic climate, the North Pacific Theater of operations was one of the most difficult, treacherous, and unpleasant theaters of operations in the Pacific. Men suffered cold, hardship, and extreme isolation to bring the war to the occupying Japanese. Now, like the Greenland Operations Area both almost forgotten theaters of WWII.

Left: Circa May 1943 Puget Sound. BB36 after repair and modernization. Note the solid structure the after fire control tower is mounted on this was changed to a short tripod after the Aleutians operations, and prior to the ship deploying to the European Theater. The ship is painted Ms11.

Right: 23 Aug 1943 Norfolk NSY. BB36 after overhaul. Note the sloping stack extension which was unique to the BB36. The ship is now painted Ms22. Note the addition of the SK set to the foremast. And the 3 gun 20mm tub to the forecastle, another feature unique to the BB36. The BB36 was the only USN 2nd generation ship to serve in the Atlantic after 1941. She was the most modern of the USN support BB's at D Day and the South of France operations.



Left: 8 Nov 1944 off Norfolk NSY. BB36 after completion of overhaul performed prior to transferring to the Pacific Theater. Note the stepped secondary DP battery of 8 twin 5"/38 mounts, and the associated 4 Mk37 DP directors with improved Mk12 radars and co-located Mk22 height finders. The ship has just left the refitting piers and is riding high in the water indicating that all the ammunition and consumables are not yet aboard. BB36 started WWII in the Pacific at Pearl Harbor but after repairs and supporting the landings at Attu and Kiska Alaska, transferred to the European Theater, not returning to the Pacific until early 1945.

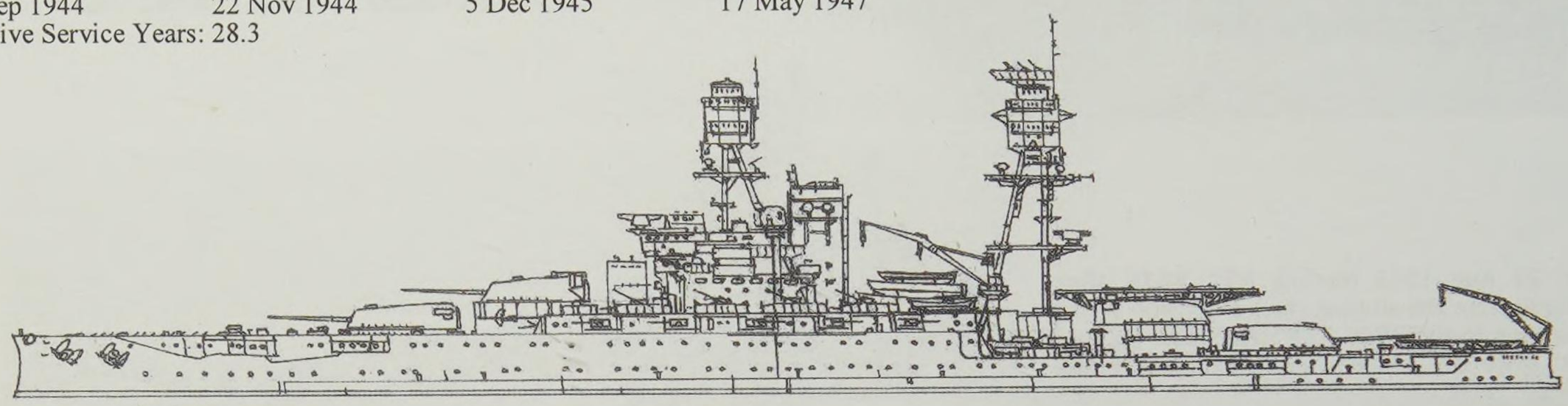
Left: Apr 1945 BB36 at anchor at Ulithi Atoll in the Caroline Islands. The ship is preparing for the upcoming Okinawa operation. The ship painted Ms32/6b. BB36 was repainted to Ms21 immediately following the Okinawa operations. This BB36's final WWII configuration.

Right: Jul 1946. Bikini Atoll. BB36 repainted International Orange to serve as the aiming point for the Shot Able air drop Atomic Bomb test. Note that 2 of the twin 5"38 mounts have been removed. The ship has equipment located on the fantail for test purposes.

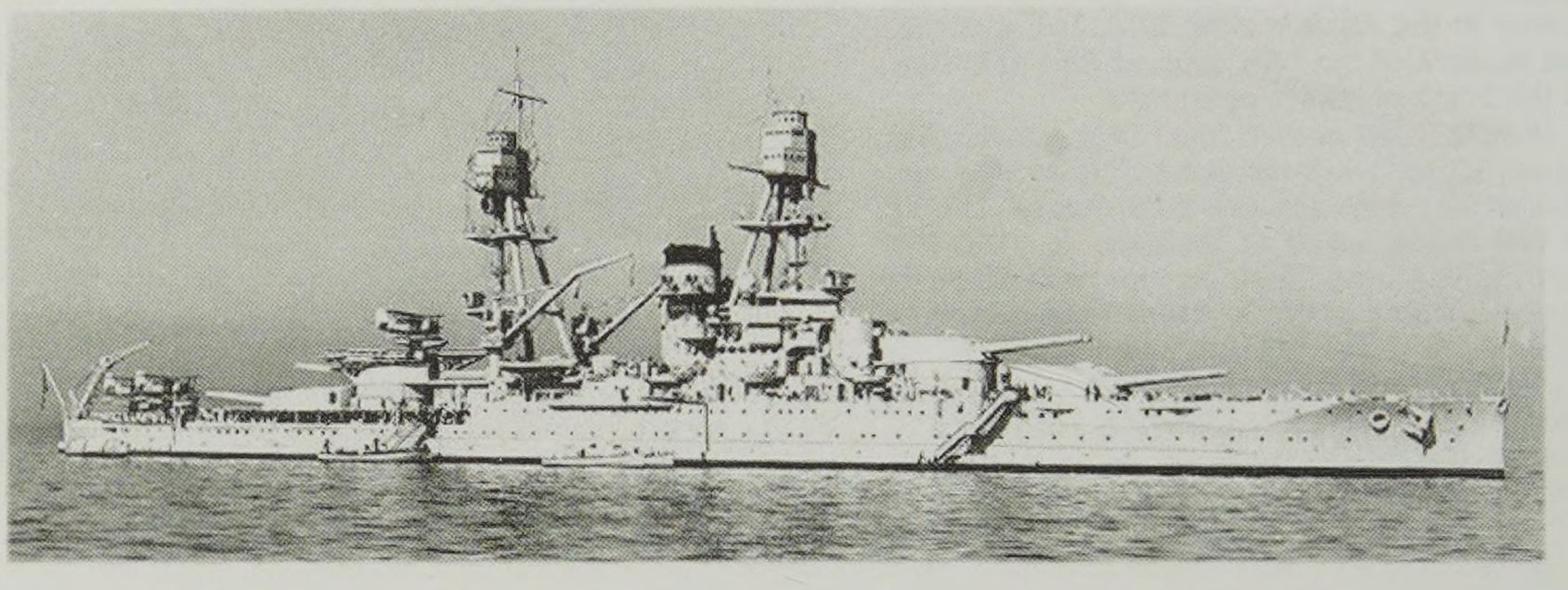
Battleship USS Oklahoma BB37 Call Letters: **NADN**

Builders Yard	New York Shipbuilding Co Camden NJ		
Modernizing Yard	Bremerton NSY 1927/29		
Modernizing Yard	none		
Modernizing Yard	none		
Scrapping Yard	Pearl Harbor NS		
Ordered	Keel Laid	Launched	1st Comm
22 Jan 1912	26 Oct 1912	23 Mar 1914	2 May 1916
Decom	Stricken	Sold for scrap	Sunk under tow
1 Sep 1944	22 Nov 1944	5 Dec 1945	17 May 1947

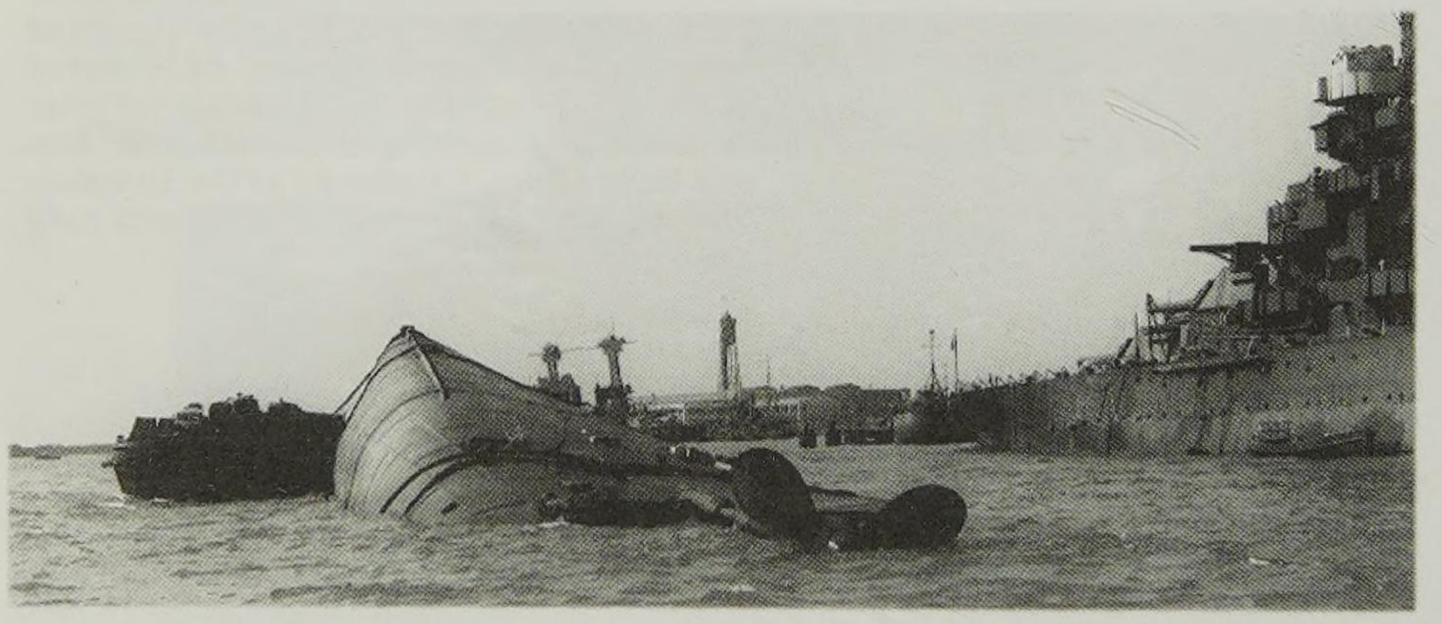
Active Service Years: 28.3



USS Oklahoma BB37 Nov 1941 Ms1

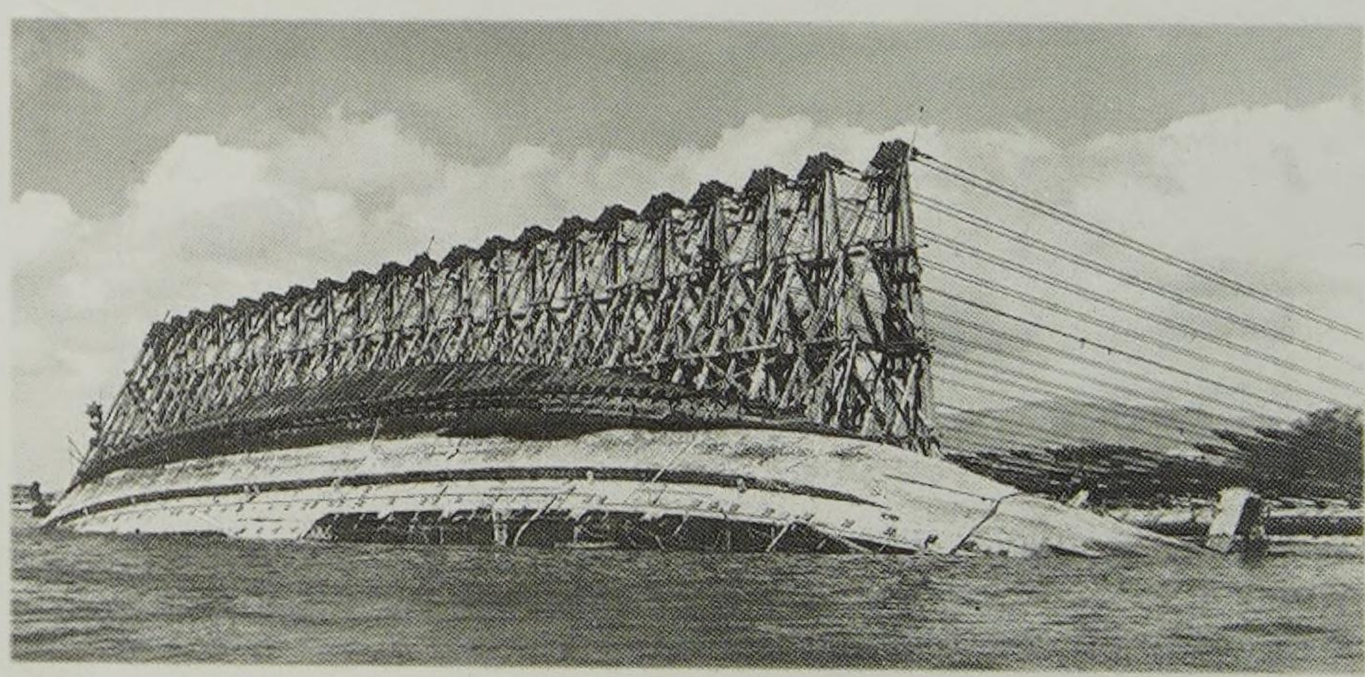


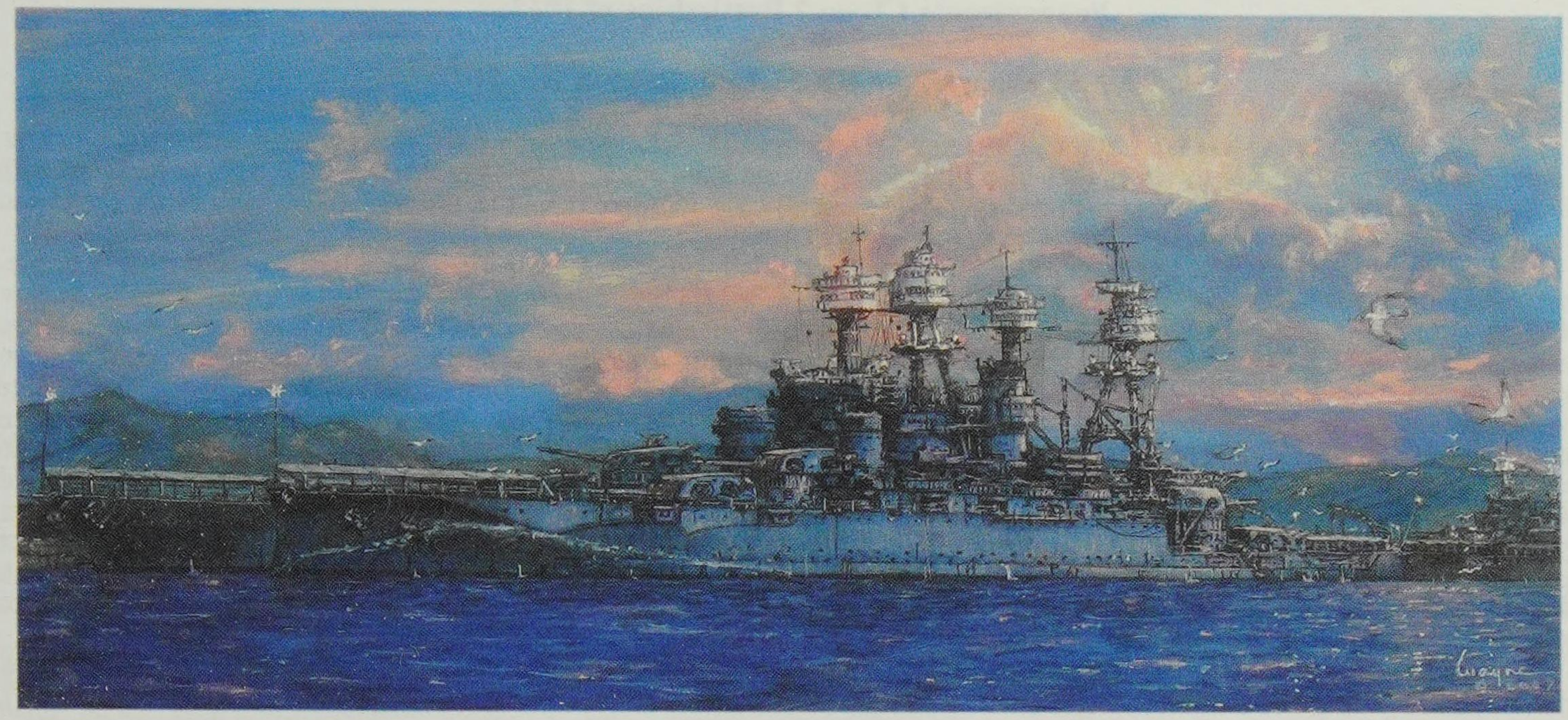
Circa 1940 off Long Beach, CA. BB37 is illustrative of the prewar configuration of the BB36 class. Note the twin tripods, tall stack, heavy boat cranes, and catapult atop turret 3, and the large number of portholes. The ship is painted Ms3 "prewar white". Starting in Oct 1940 all USN Pacific BB's were repainted Ms1. BB37 BB36 also had a Ms5 false bow wave. In Jul-Aug 1936 BB37 operated off Spain evacuating US nationals during the Spanish Civil War. USN photo by George Winstead.



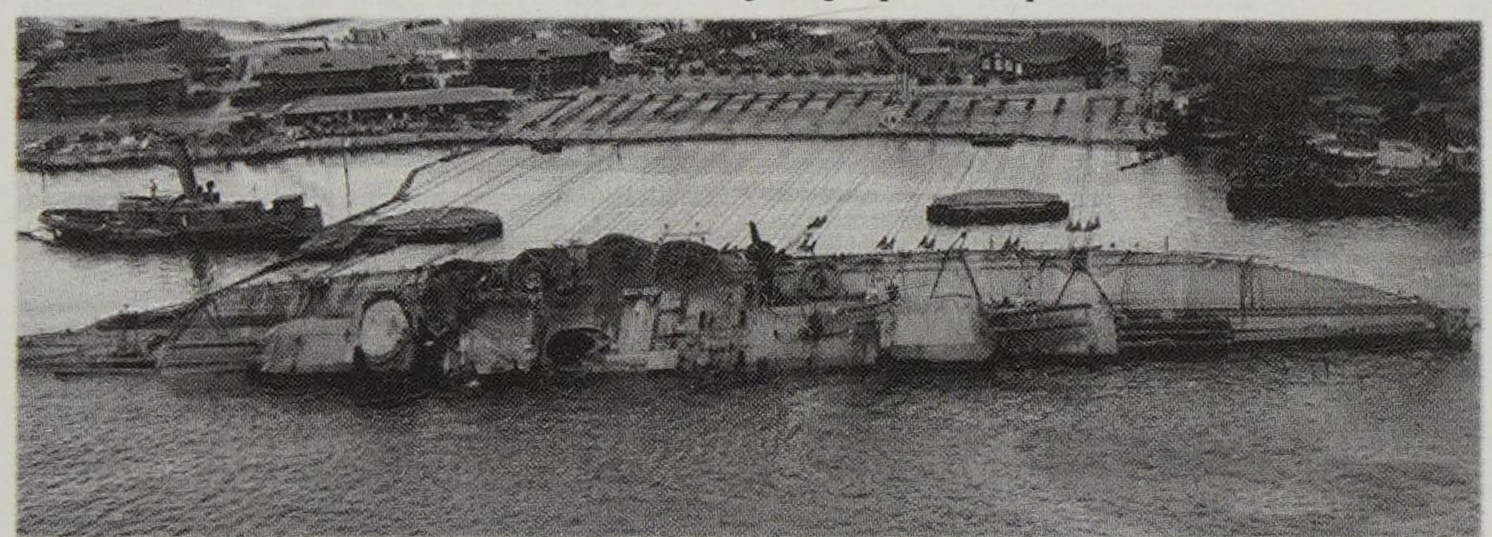
Left: 12 Dec 1941 Pearl Harbor Quay F5. BB37 capsized outboard of BB46. BB37 was moored in the usual spot used by BB46 on the morning of 7 Dec 1941. This was due to BB37 having returned from an at sea period with AG16 BB36 and BB39 on Friday 5 Dec 1941. 447 crewmen were trapped in BB37 when the ship capsized. 32 men were rescued by cutting thru the bottom of the ship. Note the Mk19 director on BB46 and the rangefinder atop turret 2.

Right: 8 Mar 1943. Pearl Harbor. BB37 during the early stages of the righting process still at a 135° angle. The wooden "bent extensions" were need to add leverage for the winch cables in order to rotate the ship about it's axis rather than dragging the ship inboard towards Ford Island. As access was impossible the salvage operation was conducted with all BB37's ammunition load 1,200 14´rounds and powder charges aboard. Many of the 14" projectiles in the magazines had broken loose when the ship capsized.



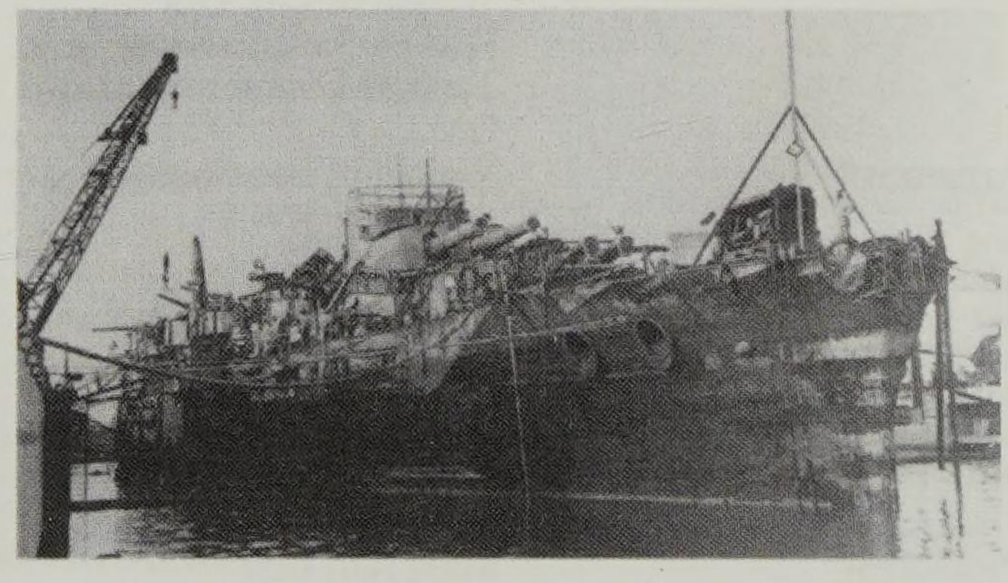


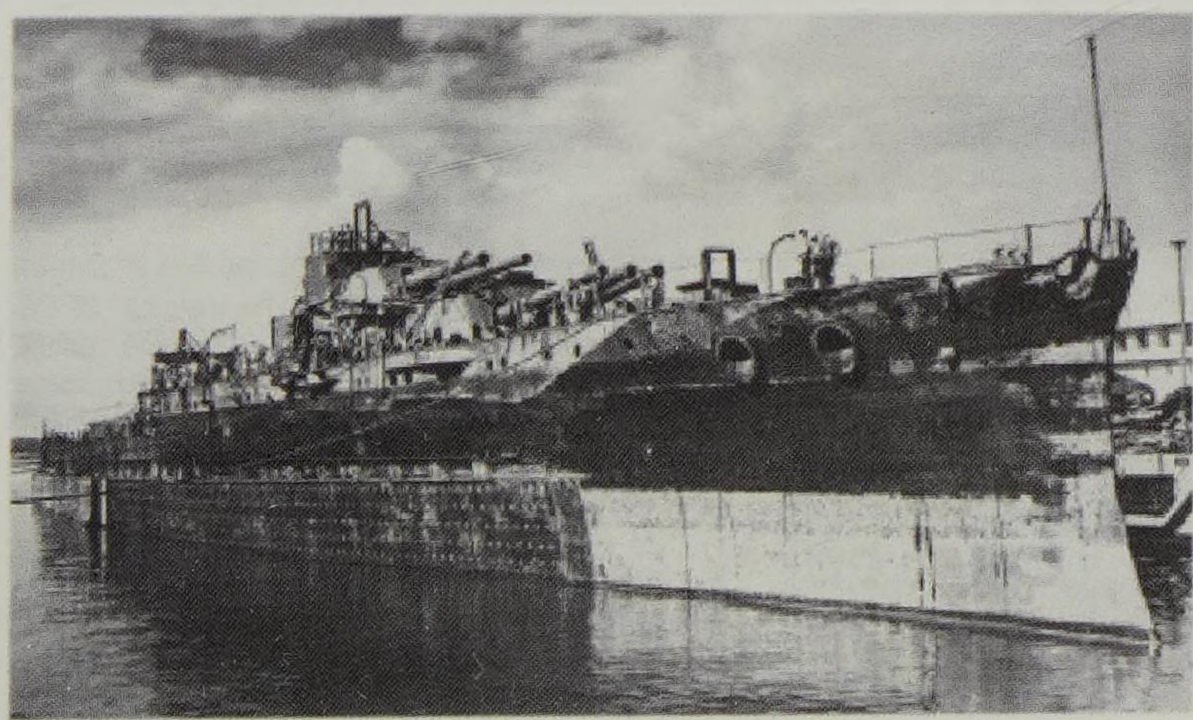
Above:**"Dawn of Infamy" 0630 7 Dec 1941" USS Oklahoma BB37.** Starting at 0800 local time Oklahoma was hit in rapid succession by 5 or 6 air dropped torpedoes. With no time to implement counter flooding to keep the ship on an even keel. In less than 10 minutes BB37 capsized to port coming to rest almost inverted with her fighting tops and superstructure buried in the muddy bottom of Pearl Harbor.



Above: 29 Mar 1943 BB37 under righting at a 32° angle. Note the beached winches anchored on Ford Island and cabling rigs used to right the ship. Notice also that the bents are no longer in use.

Right: 28 Dec 1943 Pearl Harbor Drydock 4. BB37 afloat 2 years, and 3 weeks after being sunk. BB37 entered the drydock1 with a 39.5' draft just barely clearing the 40' endsill. Due to the extensive damage and general overall obsolescence of BB37 (particularly the reciprocating engineering plant), the decision was made not to repair the ship. The hulk was opened for bids for scrapping in Dec 1944. BB37 was sold 5 Dec 1946 to Moore Drydock Co of Oakland CA.





Left: Circa Jan 1944 Pearl Harbor. BB37 with temporary repairs completed and undocked. BB37 was stored in this configuration in the West Loch of Pearl Harbor until 1947. Note the retention of main guns and turrets, and the removal of the armor belt. Before storage the main guns were removed pierside, refurbished and reissued to the fleet. The turret housings were left in place and the hulk was repainted Ms13. Much of the mud and debris accumulated within the ship during BB37's underwater period was left in place.

Pennsylvania Class: 2 Battleships of 1912:

USS Pennsylvania BB 38 USS Arizona BB 39

The Pennsylvania class were minimal incremental improvements of the preceding BB36 class fitted with 4 triple turrets. As completed like the BB36 class ships, they also fitted 2 cagemasts and 1 stack. They were the last USN BB's to be fitted with hull mounted casemate secondary armament and ram style bows. Both ships were rebuilt as the BB36 class with tripod masts and secondary battery relocated to the main deck level in the early 1930's.

At Pearl Harbor BB38 was in drydock 1 and received minimal damage from 2 bombs. BB38 received repairs to pre-attack configuration with the addition of .50 cal MG's light AA guns and 'Pacific Fleet' splinter shields to the 5"/25's. In Nov 1942-Apr 1943 BB38 underwent an extensive modernization at Mare Island NSY. The heavy after tripod mast, the searchlight platforms on the stack sides, the amidships boat cluster, the heavy handling cranes, and the aircraft catapult was removed from turret 3. A small tower structure was added aft. Two Mk37/Mk4 DP directors were added to the wings of the bridge superstructure. The foretop of the forward tripod was reduced and the sides indented. The casemates and heavy AA were removed and replaced with sixteen DP 5"/38's in 8 twin mounts on the 02 level. Numerous 20mm/40mm mounts were also incorporated into the new design. The ship had an SK type radar fitted atop the mainmast and an SG type on the foremast. In mid 1943 the SK radar was relocated atop the foremast. BB38 was seriously damaged aft when torpedoed by an aircraft at Buckner Bay Okinawa on 12 Aug 1945. Temporary repairs were completed, but with the conclusion of WWII the decision was taken not to permanently repair BB38. The ship was subsequently designated as a target ship for Operation Crossroads. BB38 survived both tests and was stored at Kwajalein. BB38 was scuttled off Kwajalein in Jul 1948. The ship probably sank as much due to progressive flooding, from the unrepaired torpedo damage giving way as to the effects of the scuttling charges.

BB39 was struck by 8 bombs and 1 torpedo during the Pearl Harbor attack. At approximately 0802L BB39's forward magazines detonated as result of hit from a horizontal bomber with a modified 16" shell with fins (type99 No80 Mk5 1,757lbs.), almost breaking the ship in two forward of turret 1. Most crewmen of BB39 perished without ever knowing they what nation that they were at war with. BB39 took 1102 sailors to the bottom with her. BB39 was not raised and the superstructure and guns above the 01 level removed in Feb 1942. However, BB39 continues to serve on, having becoming the foremost symbol of the attack on Pearl Harbor. In 1962 a memorial structure was built over the amidships section, and the ship dedicated as a War Memorial in remembrance of those who served in WWII. The ship is not in commission, nor on the Naval Vessels Register (NVR). BB39 is currently administered by the National Parks Service.

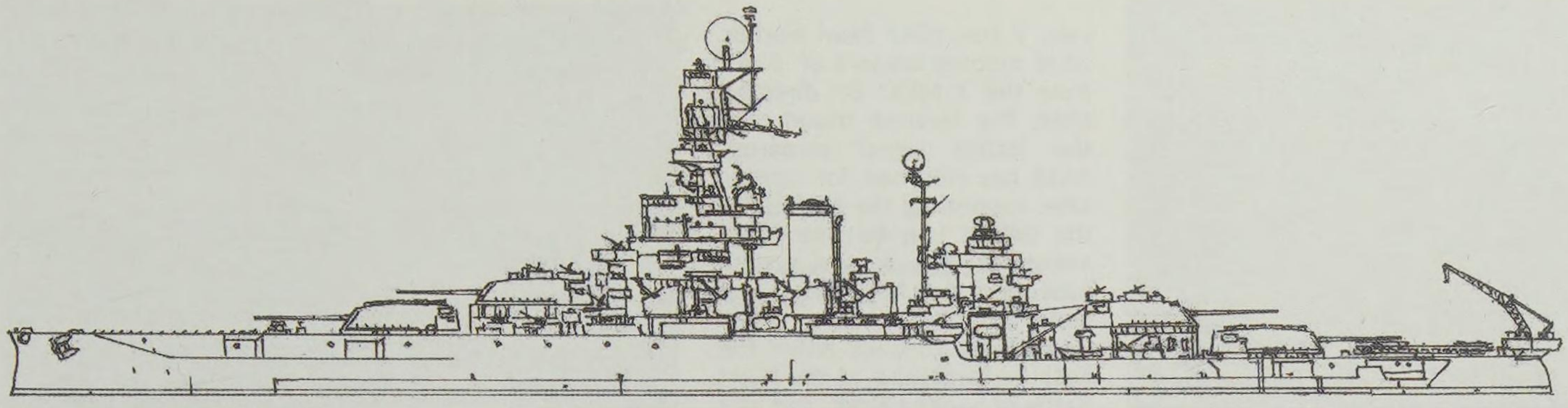
Pennsylvania Class Battleships Statistics

Displacement	Std/Fl 1943	33,124.8 tons /35,548 tons
Dimensions	Length WL/OA/Beam	600'0"/612' 3"/106" 0
	Draught	29' 6" nominal
Machinery	Type	4 Geared Turbines
	Boilers	8 oil fired
	Shafts/designed SHP	4 shafts/28,900 shp nominal
	Rudder	single
	Max Designed Speed	21.00knts
	Weight of Eng Plnt	2,064 tons
	Fuel bunkerage/Range	2,198.1 tons/8,000nm @10 kns
	Tactical Diameter	705 yds @ 20.7 kns
	GM	5.9
Armament:	Weight of Broadside	18,000lbs/9.00tons
	Projectile Weight	2,000lbs/1.00tons
	Max range	36,300yds/20.62miles
	Rnds Weight / per Min	2.0/18.0 tons
	Rnds per gun/Total Rnds	100/1,200
	Main	12-14"/45
	Sec 1942/45	12-5"/51/16-5"/38
	AA 1942/45	8-5"/25/40-40mm
	Lt. AA 1942/45	4-3"/50/26 20mm
Protection	Main (wl) Belt	13.5-8.0" /0
	Total/Decks	5.02"/3 Decks
	Turret:	18"face 5"side 10" top 9" back
	Total Armor Weight	10,078 tons
Catapults/Aircraft	1942/45	2/1 cats 4/2 aircraft

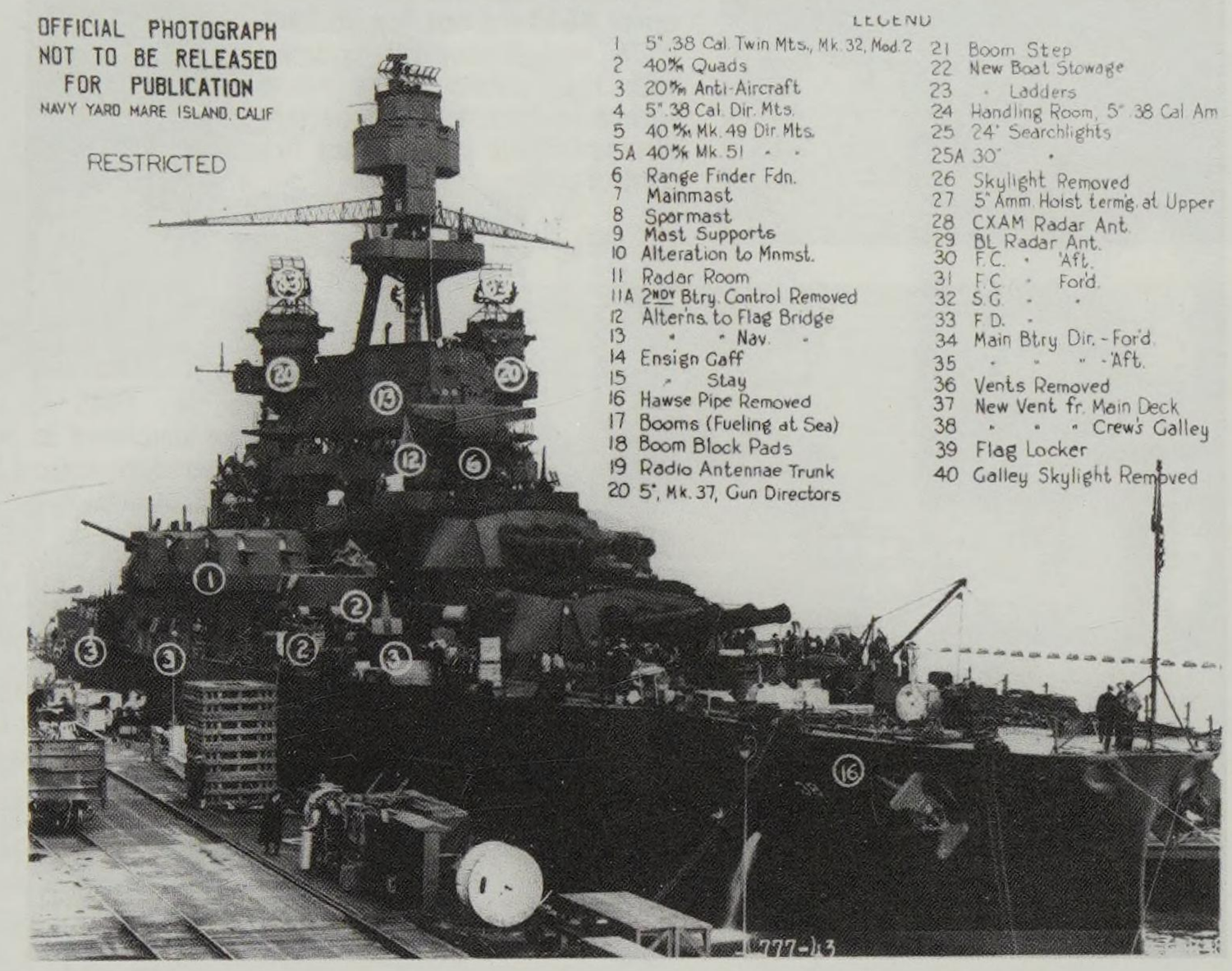
Battleship USS Pennsylvania BB 38 Call Letters: **NADX**

Builders Yard	Newport News Shipbuilding Co Norfolk VA		
Modernizing Yard	Philadelphia NSY 1929/31		
Modernizing Yard	Mare Island NSY 1942		
Modernizing Yard	Bremerton NSY 1943		
Modernizing Yard	Mare Island NSY 1945		
Scrapping Yard	-		
Ordered	Keel Laid	Launched	1st Comm
22 Jan 1912	4 Nov 1912	11 Jul 1914	11 Mar 1916
Decom	Stricken	Sunk as Target	
29 Aug 1946	19 Feb 1948	31 Jul 1948	

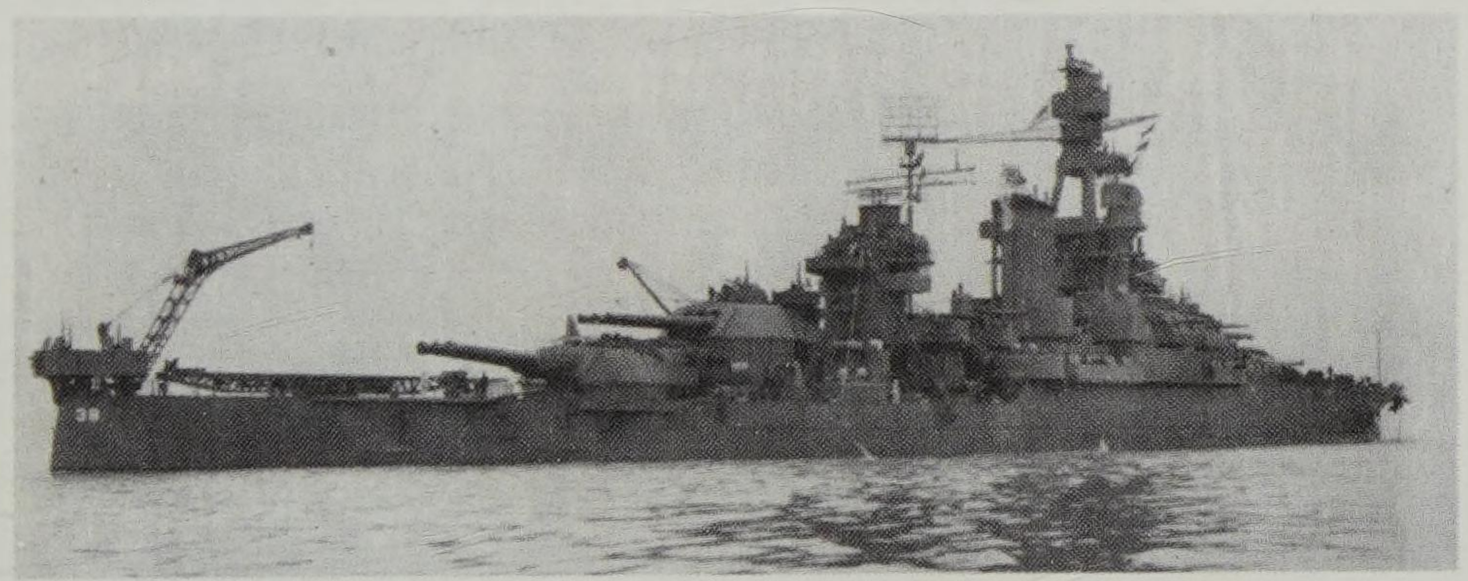
Active Service Years: 30.2



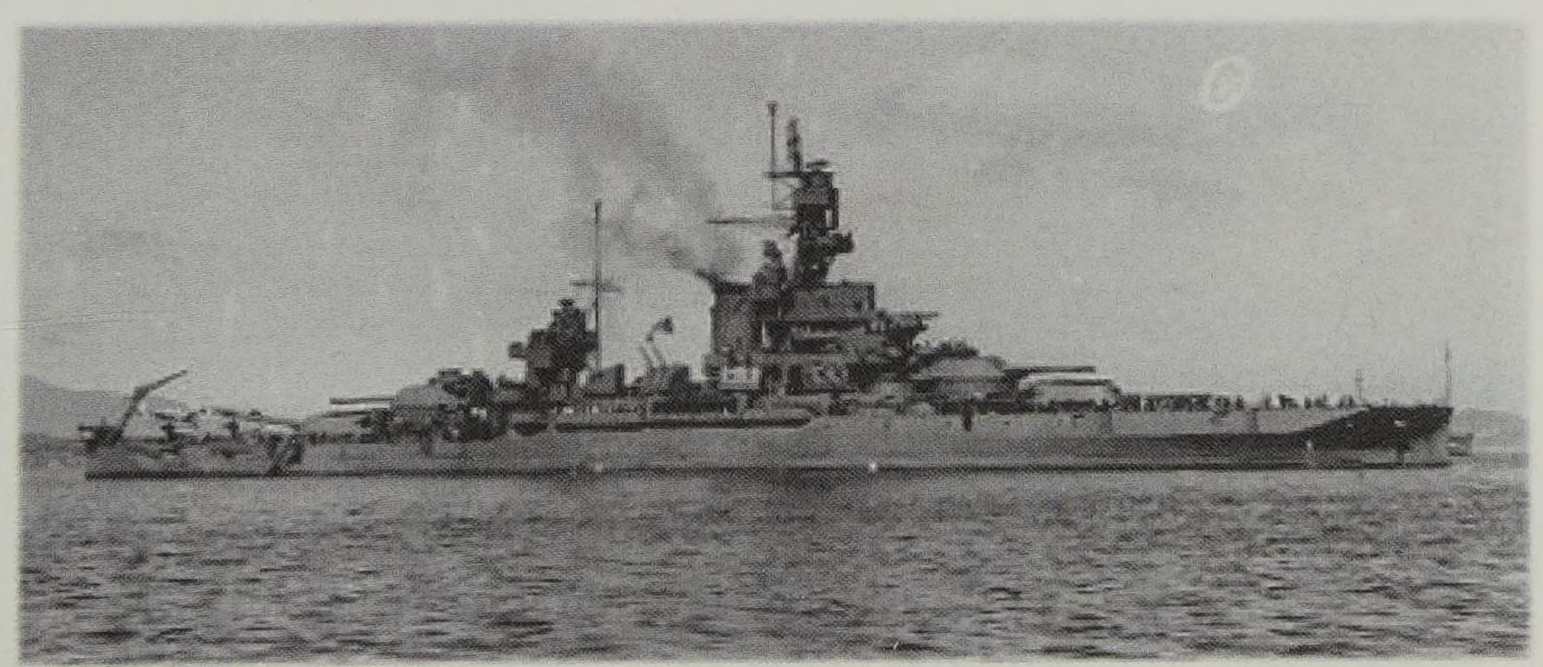
USS Pennsylvania BB38 Aug 1945 Ms21



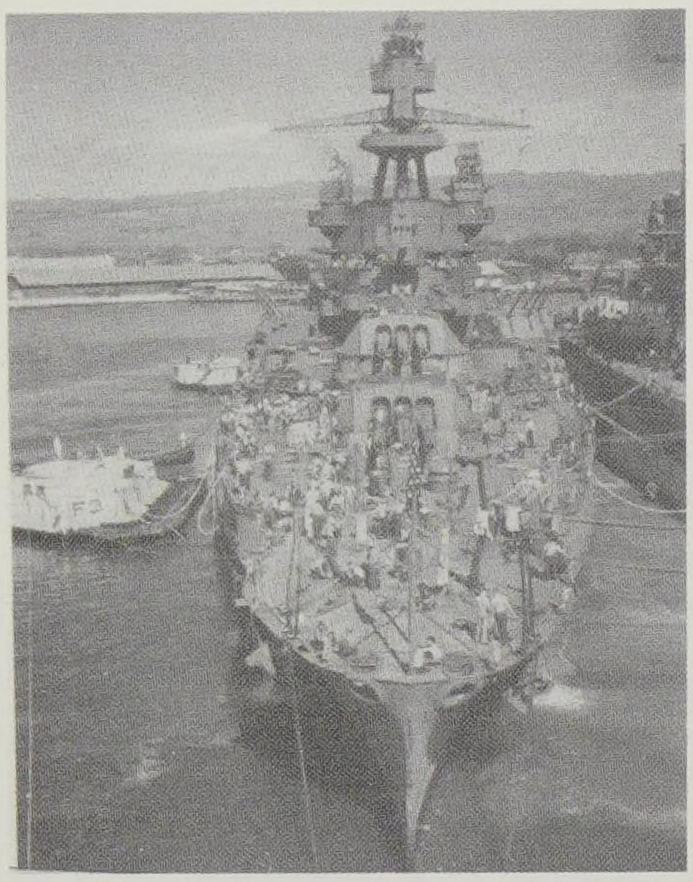
Right: Feb 1943 Mare Island NSY. A photo with keys for the additions and changes made during BB38's modernization from Oct 1942-Feb 1943. BB38 was unique inasmuch as it was the only BB on the West Coast not to be modernized at Puget Sound NSY. Mare Island was not a usual repair nor service base for BB's. Hunters Point was the usual Naval Shipyard in the San Francisco Bay Area used for BB's, due to channel depth issues. Paint is Ms14. Mare Island is known for their excellent photographic record of the repairs and modernizations performed on vessels there during the WWII era.



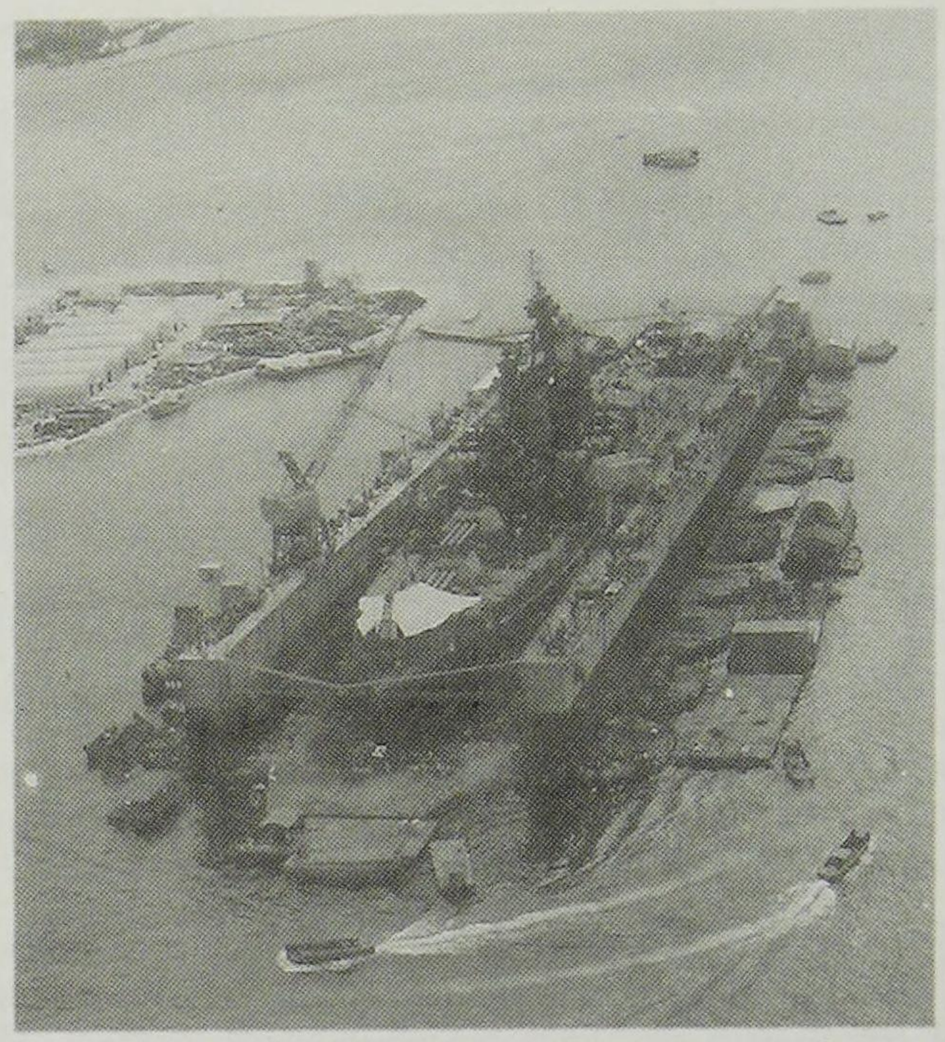
Left: 1 Feb 1943 off Hunters Point NSY. BB38 underway after completion of overhaul and modernization. Note the SK radar is fitted atop the mainmast, the Mk3 main battery fire control radar atop the after tower, the lattice signal yardarms. Note also the raised guntub above the stern for 3 20mm's. Only the BB46 and BB38 rebuilds had the secondary twin 5"/38 battery located on a single level.

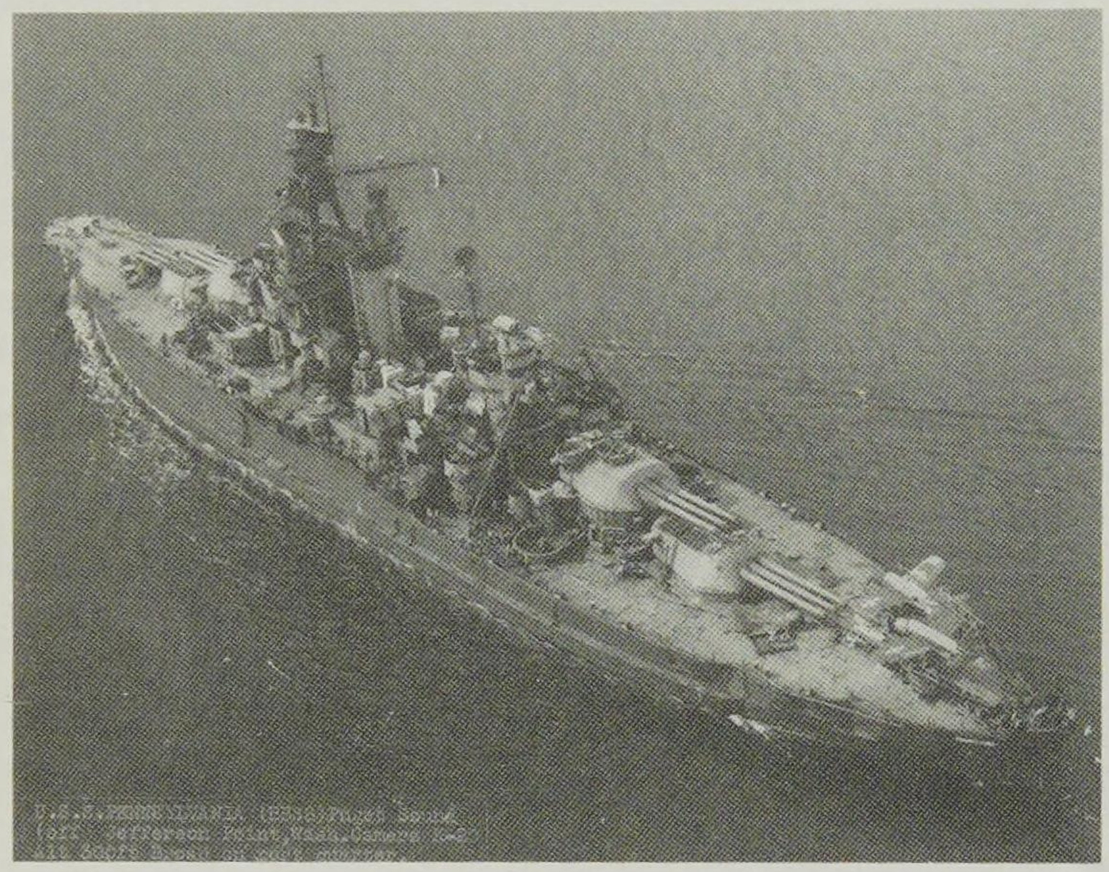


Right: 12 Aug 1943 Adak Harbor Alaska. BB38 anchored prior to the landings on Kiska. Note the SK air search set has been relocated to the foremast to allow 360° coverage. Note also the 5"/38 DP battery is trained out in a AA sector defense configuration. Paint is the Ms21 BB38 wore from Jan 1942-Jul 1946.



Left: 7 Dec 1943 Pearl Harbor. BB38 moored inboard of BB45. Note the 2 Mk37 DP directors abaft the forward tripod, and the lattice signal yardarms. BB38 has returned for upkeep after supporting the landings in the Gilbert Islands. Due to an antiquated fire control system based on the Mk3 radar and manual plotting boards BB38 was unable to track either the Fuso or Yamashiro at the Night Battle of Surigao Strait, and as a result BB38 did not fire. In 1945 BB38 had firecontrol updated with the addition of a Mk34 with a Mk8 radar main battery director fitted to the after fire control tower.





Above: Sep 1945 Apra Harbor Guam ASBD3. Repair of torpedo damage sustained at Buckner Bay Okinawa on 12 Aug 1945. BB38 was severely damaged in this attack and had to be towed to Guam. While enroute to Puget Sound NSY shaft 3 gave way and slipped aft, almost resulting in the loss of the ship. Note the awning on the fantail. Awnings were routinely deployed by BB's at anchor or in drydock during WWII. They were usually dyed a light blue/gray color so as to blend better with the dock and/or water.

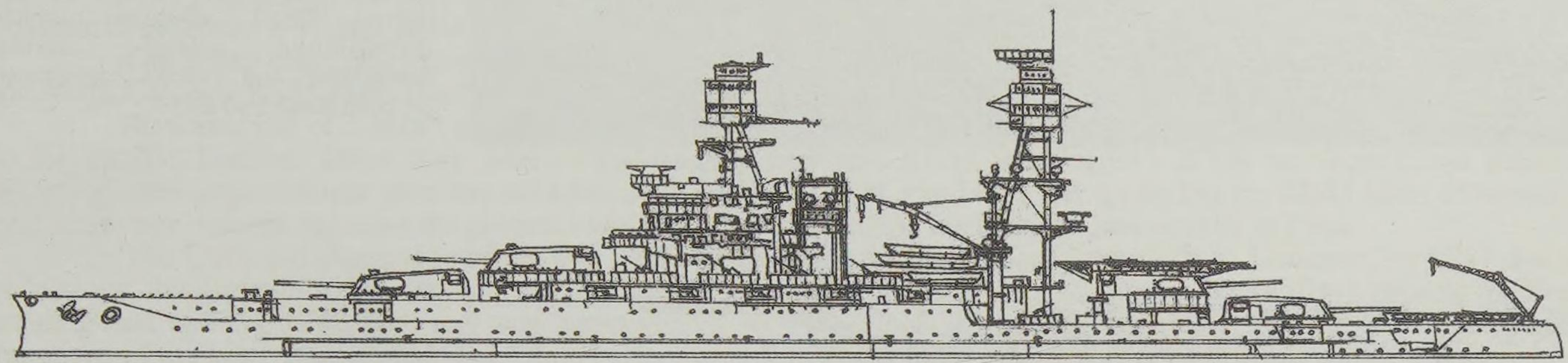
Left: Circa Jun 1946 BB38 off Puget Sound NSY en route to Bikini Island in the Marshall Islands. BB38 was designated as a target for the Operation Crossroads Atomic Tests in Jul 1946.

Below: USS Pennsylvania BB38 Lingayen Gulf off Luzon Island in the Philippines Jan 1945. The Pennsylvania is executing a port turn en echelon with the battleship USS Colorado, heavy cruisers USS Portland, and USS Chester. The ships are maneuvering into position to start a pre invasion 'softening up' bombardment to support those men and ships who have 'returned' with General MacArthur to Philippines. Overhead are US Army P40E Warhawk fighters.

Battleship USS Arizona BB39 Call Letters: **NABW**

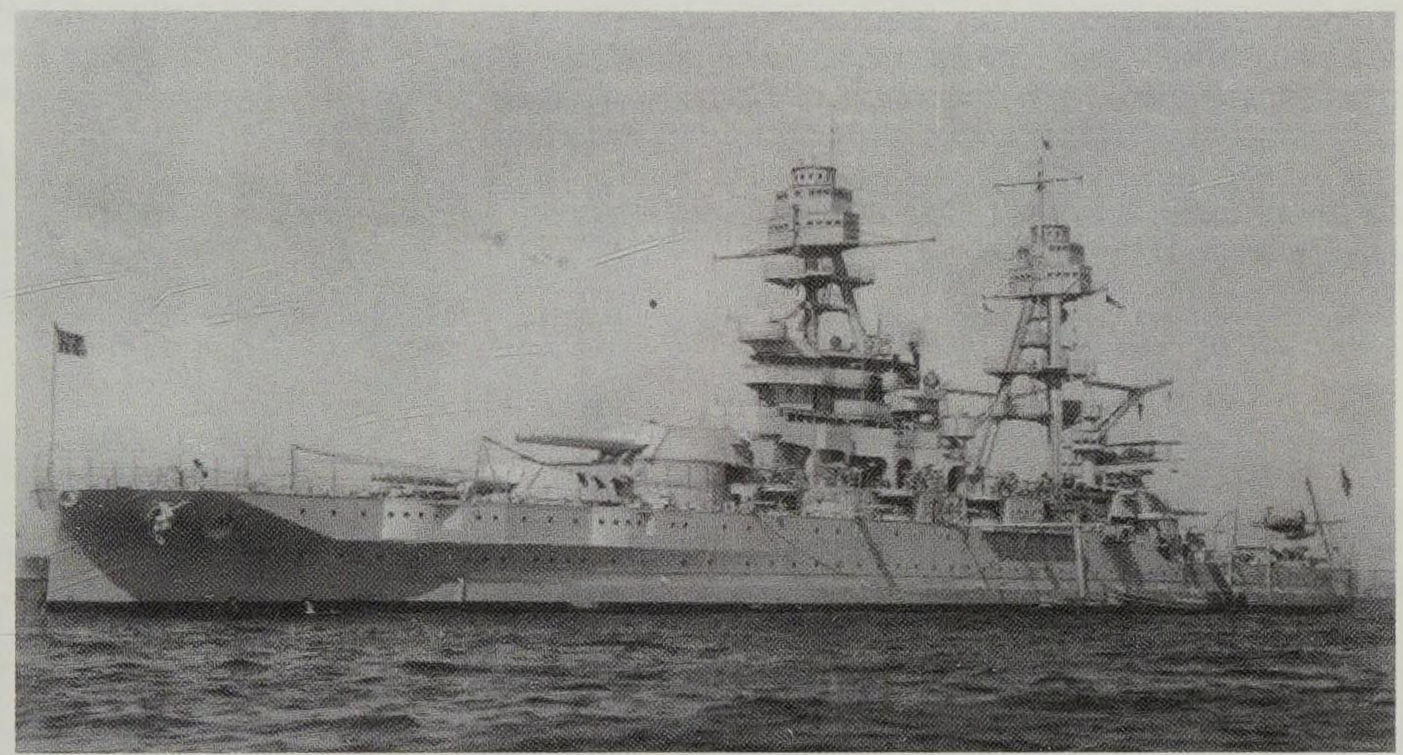
Builders Yard	New York NSY Brooklyn NY		
Modernizing Yard	Norfolk NSY 1929/31		
Modernizing Yard	none		
Modernizing Yard	none		
Scrapping Yard	Pearl Harbor NSY		
Ordered	Keel Laid	Launched	1st Comm
24 Jun 1913	16 Mar 1914	15 Jun 1915	17 Oct 1916
Sunk	Decom	Stricken	Designated Memorial
7 Dec 1941	29 Dec 1941	1 Dec 1942	30 May 1962

Active Service Years: 25.2

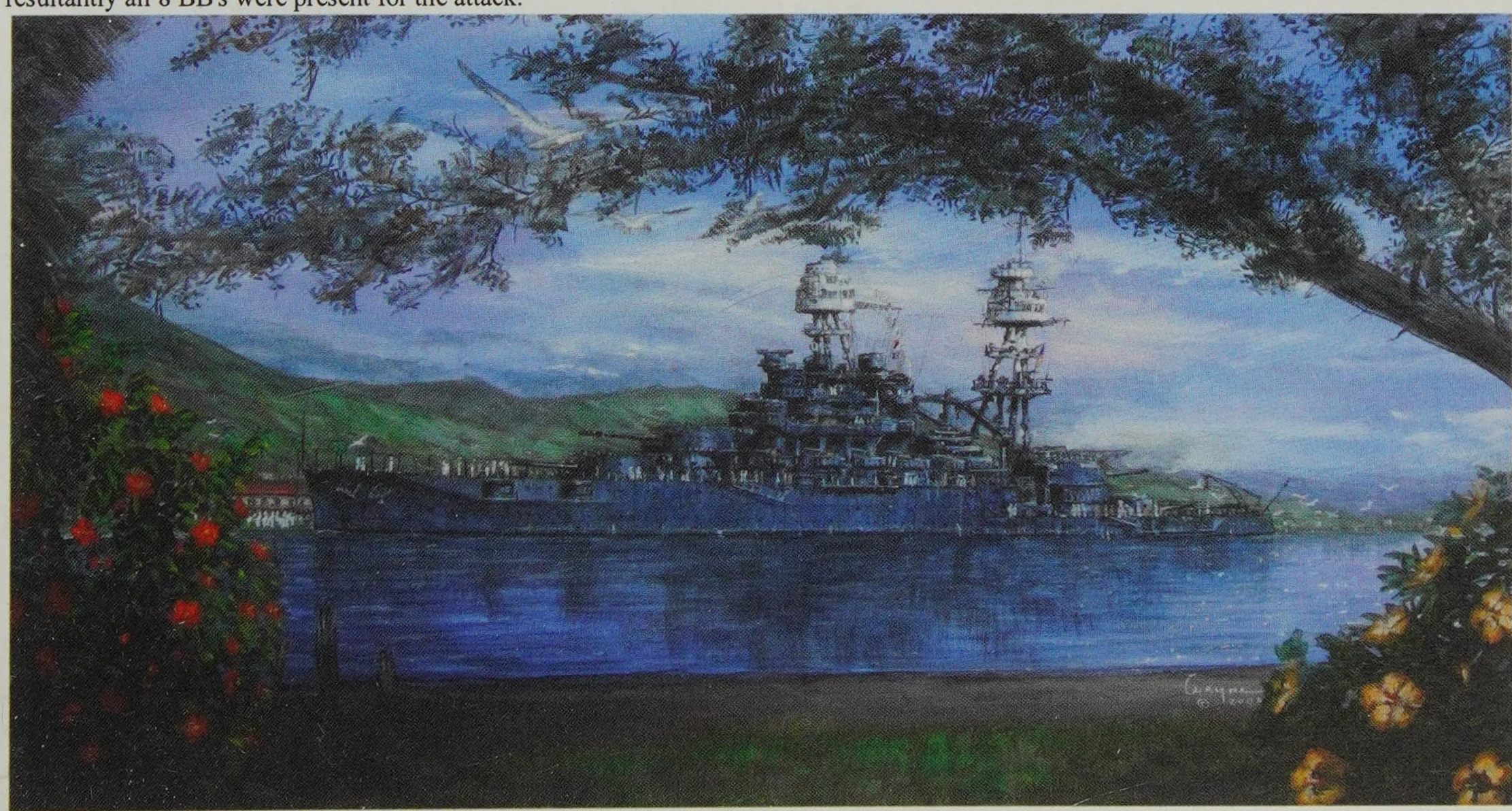


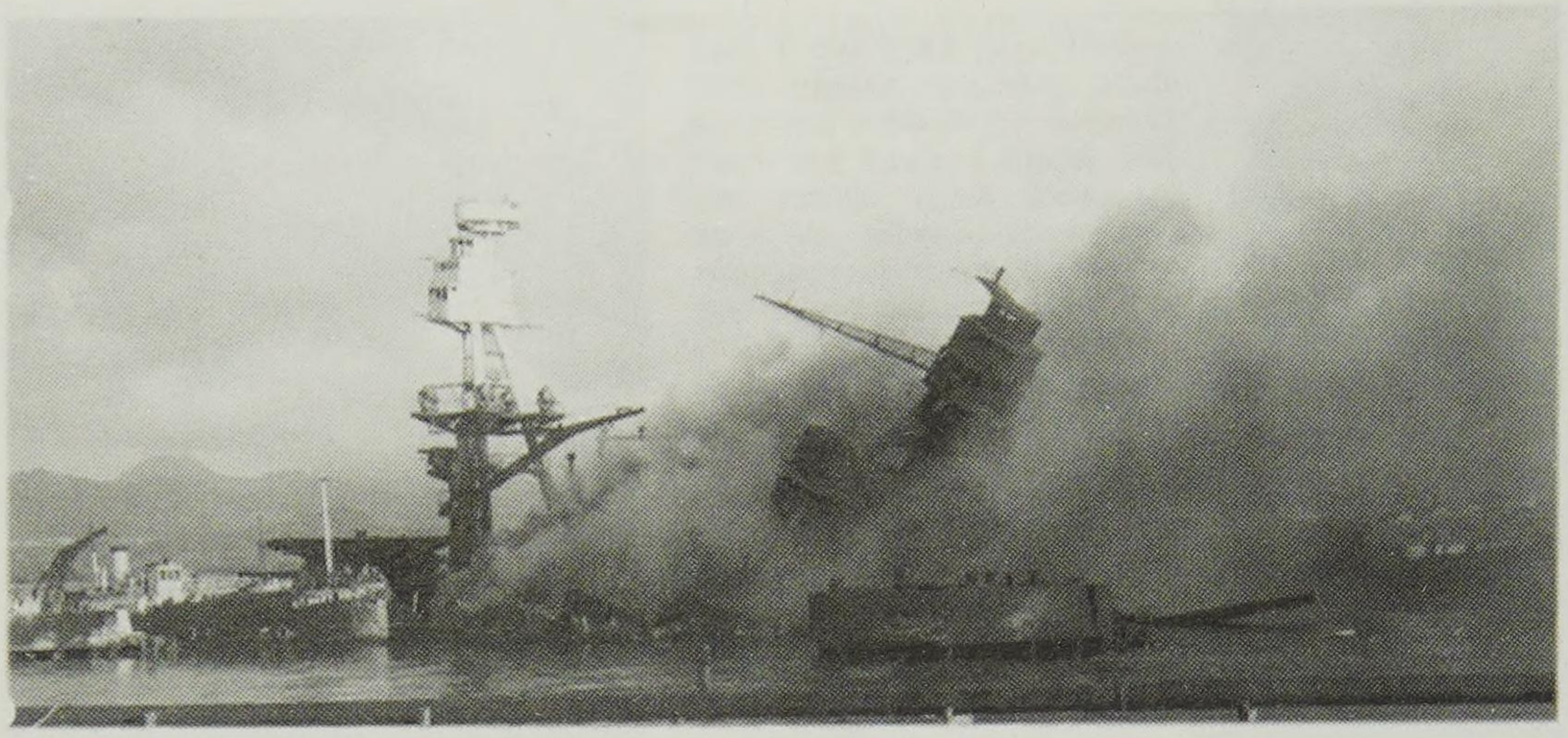
USS Arizona BB39 Nov 1941 Ms1

Right: Circa 1935 San Pedro CA. BB39 at anchor. Note the lack of splinter shield guntubs around the 5"/25 Heavy AA Battery on the 01 level. Note the short stack, BB39 did not receive the 6' stack extension as did BB38. Note overall similarity to the prewar appearance of the BB36 class. BB39 was the last USN battleship to be fitted with a ram style bow and tripod masts.



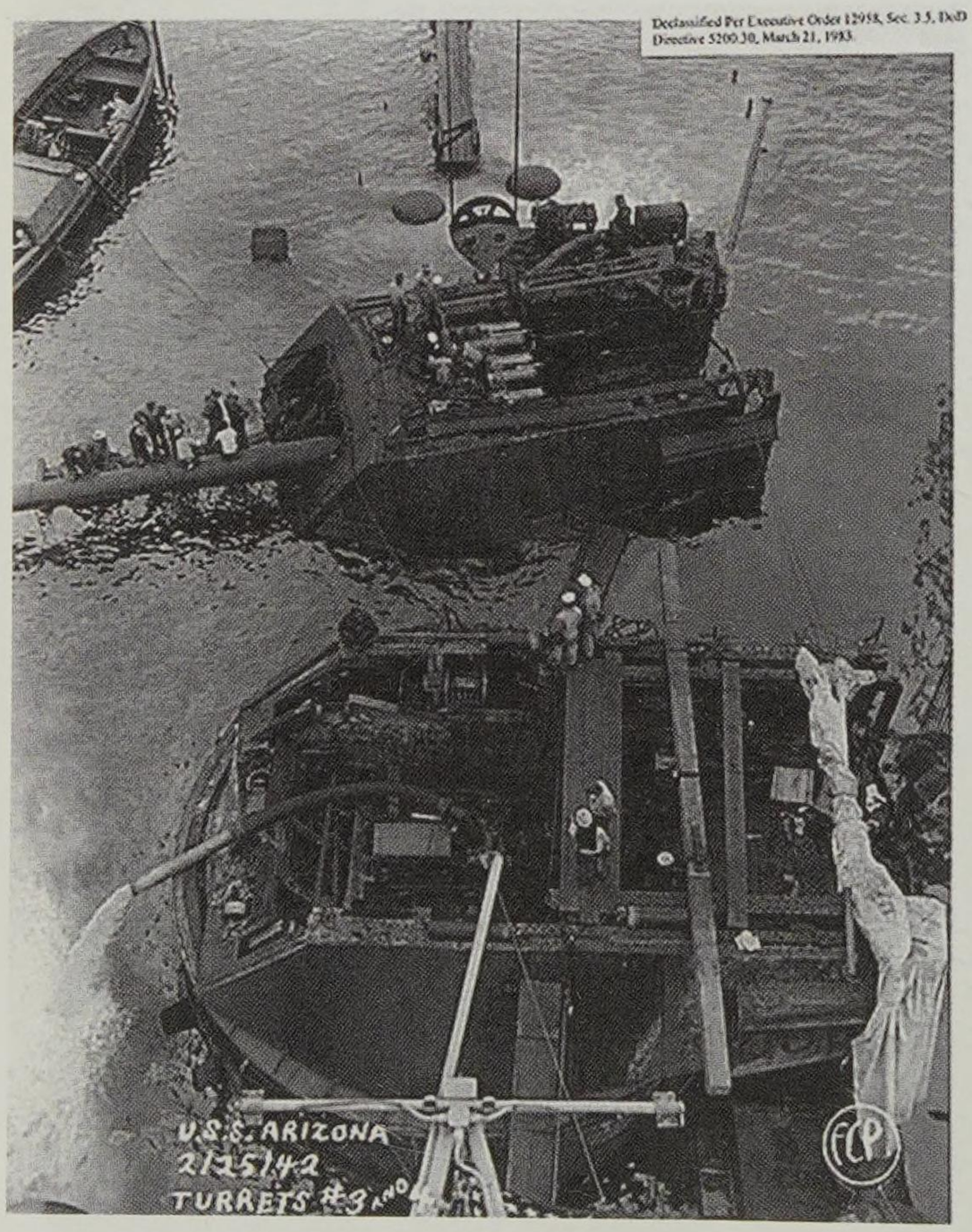
Below: USS Arizona BB39 opposite Hospital Point in the Pearl Harbor Channel 5 Dec 1941. BB39 is entering Pearl Harbor for the last time after completing a 5 day at sea patrol and training period in company of the AG16 BB36 and BB37. Local patrols were implemented in Oct 1941 to prevent all the Pacific Fleet BB's from being in port at once as a response to the stream of War Warnings and Alerts received during Oct-Dec 1941. However, an exception had been made for 6/7 Dec 1941 and resultantly all 8 BB's were present for the attack.

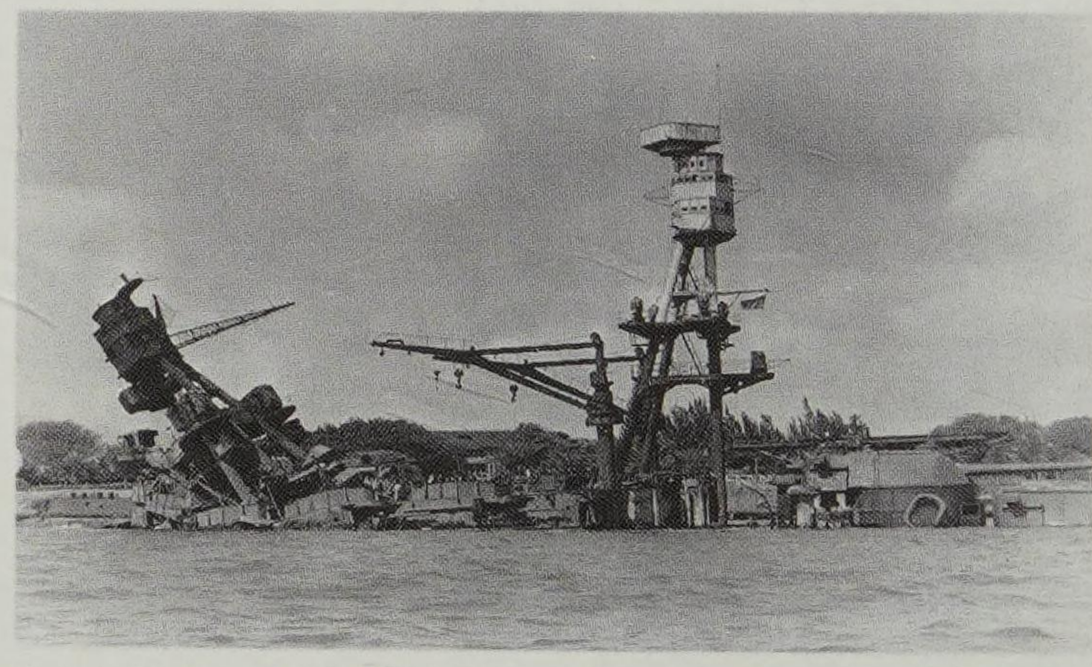




Left: 8 Dec 1941 Quay F8 Pearl Harbor. BB39 is still burning as a result of the ship's magazine explosion. The bomb was a modified 16" projectile that penetrated the armor of the magazine at an access hatch and detonated the forward 14" powder magazines and resultantly the forward 14" projectile magazines which contained approximately 600 rounds and a corresponding number of powder charges. Note the Garbage Lighter YG17 alongside which distinguished itself during firefighting and rescue operations on both BB48 and BB39.

Right: 11 Dec 1941 Pearl Harbor. The wreck of the BB39. Note the 5"25 AA guns, now in guntubs, are still pointed skywards as the ship was returning fire when the major explosion that destroyed the ship took place, the guns also continued to fire afterwards. Notice the circular platform for a radar antenna which had not yet been installed. All of the BB's at Pearl Harbor received this platform in their final prewar overhauls in anticipation of the sets becoming available and were scheduled to be installed in early 1942. The top of turret 2 is just visible above the water forward of the remains of the bridge.





Above: 12 Dec 1941 Pearl Harbor. As the explosion of the forward magazines almost tore BB39 in two forward of the number 1 turret. Turret 2, the bridge, and forward tripod collapsed forward into the void left by the explosion. Note the stack is also missing as it was used by the force of the magazine detonation for gasses to escape upwards. Which resulted in plume of soot and gasses ejecting above the masts of the ship, and tearing off the stack. This led to the assumption that the bomb had gone down the stack and detonated the boilers (at the time only one boiler was under steam to provide ships power). All BB's had only one boiler on line on 7 Dec 1941 except for BB36 which had two under steam and resultantly BB36 had enough steam to get underway during the attack.

Left: 21 March 1943 Pearl Harbor BB39 scrapping. When the after 2 turrets and guns were removed they were handed over to the US Army and installed on concrete pads located in central Oahu as Army manned coastal artillery. From this location the guns would be able to reach any potential landing beach on Oahu. They were named Battery Arizona (which was canceled in 1943 incomplete), and Battery Pennsylvania, which achieved IOC on 28 Aug 1945, and decommissioned in 1947.

New Mexico Class: 3 Battleships of 1914:

USS New Mexico BB 40 USS Mississippi BB 41 (AG128) USS Idaho BB 42

The standard incrementally improved repeats of the preceding the BB38 class. The BB40 class ships were first USN BB class to be fitted with clipper bows to enhance seakeeping qualities. As completed the ships fitted 2 cagemasts, a single stack with, for the 1st on a USN BB design, the secondary armament located on the maindeck level. BB41 and BB42 were completed with the standard direct drive geared turbine engineering plants. While BB40 featured the first Turbo Electric (TE) plant in a USN BB design. In the TE plant, the steam from the boilers was used to drive turbogenerator units, which provided electricity to turn electric motors on each shaft. In their mid 1930's modernizations all 3 ships were fitted with new direct drive geared turbine machinery, and "British Style" tower structures with a tall foretower and a shorter aft tower. The original plans for the 1930's modifications of the BB40 class specified fitting tripod masts as in BB36/38 class. Originally intended to be a class of two ships (BB40 BB41) funds from the sale of the two predreadnaught battleships Mississippi BB23 and Idaho BB24 to Greece made it possible to construct a 3rd unit (BB42).

The BB40 class due to their mid 1930's modernizations were considered the most modern battleships in the USN until the North Carolina BB55 class reached Initial Operational Capability (IOC) in late 1942.

Stationed out of Iceland on "Neutrality Patrol" Jul 1941-Dec 1941, the 3 BB40's were quickly transferred in Feb 1942 to the Pacific Theater. There they joined Pearl Harbor survivors BB38 BB43 BB45 BB46 on West Coast Patrol duty. An approved class improvement plan was scheduled for the BB40 class, similar to that applied to the BB43 class. However, when the end of the war became apparent the program was canceled. All 3 ships were placed into reserve in 1946.

The USN had planned to retain the 3 BB40 class ships in the postwar reserve fleet. However, by 1947 due to funding reductions, the decision was taken to dispose of the ships. BB40 and BB42 were scrapped. While BB41 became the fleet gunnery training and development ship, and was redesignated AG128 (Unclassified Miscellaneous Auxiliary), and assumed the fleet functions of the USS Wyoming AG17. Main battery turrets 1, 2, and 3 were removed. A type SX 3D air search (the only on a BB type) was installed atop a new tripod mainmast with Mk37mod0 with Mk25mod0 radars were installed atop the fire control towers. All open mount AA guns were removed and replaced with a mixed asymmetrical battery of 3 5"/38 twin mounts stbd, and 2 single 5"/54 mounts to port. In 1952 the ship was again modernized to serve as test and development ship for the Terrier (BW series) of Surface to Air Guided Missiles. Turret 4 was removed and a deckhouse was added enclosing the barbettes for turrets 3 and 4. Two Mk1 twin missile launchers were fitted atop the new after deckhouse. A Mk37mod1 missile director with a Mk25mod7 radar was fitted atop the after fire control tower. Also in 1952 the prototype automatic Mk18 6"/47 DP twin mount was installed on barbette 1. AG128 served 10 years, until Aug 1956, as a test and evaluations ship.

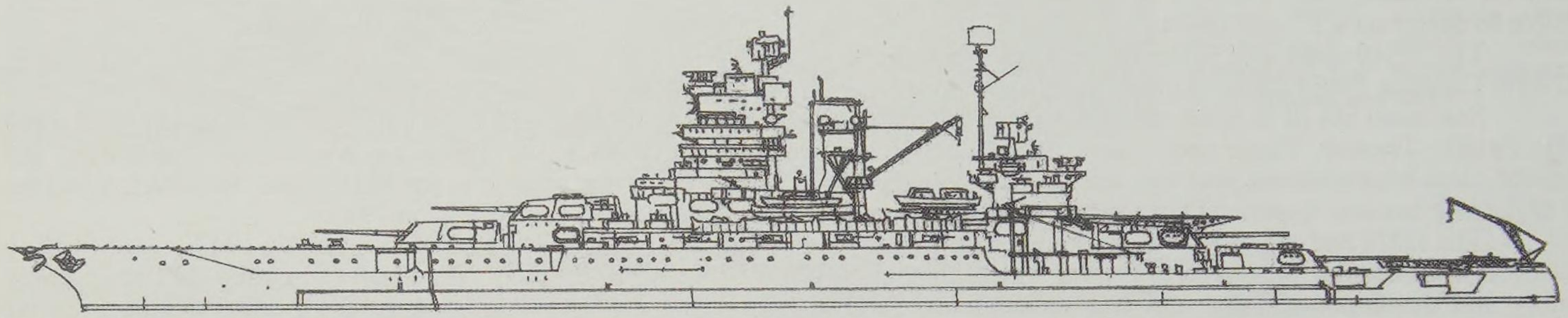
New Mexico Class Battleships Statistics

Displacement		Std/FL	32,000 tons/35,114 tons
Dimensions:		Length WL/OA/Beam	600'0"/624' 6"/106'0"
		Draught :	29' 6" nominal
Machinery		Type:	Geared Turbines 4 turbines
		Boilers	8 oil fired
		Shafts/designed SHP	4 shafts 31,000 shp nominal
		Rudder	single
		Max Designed Speed:	21.0 knts
		Weight of Eng Plnt:	2453.4 tons
		Fuel bunkerage/Range:	1,481.8tons/8,000 nm @ 10 kns
		Tactical Diameter	690 yds @ 21.0 kns
		GM	6.65
Armament:		Weight of Broadside:	18,000lbs/9.00ton
		Projectile Weight:	2,000lbs/1.00tons
		Max range:	36,300yds/20.62miles
		Rnds/ Weight per Min:	2.0/18.0tons
		Rnds per gun/ Total Rnds	100/1200
		Main	12-14"/50
		1948/56 AG128	3-14"/50/2- 6"/47 MK
	Sec	1942-44/45	12-5"/51 (BB40 BB41 and BB42 until Dec 1944)
		BB42 1945	10-5"/38
	AA	BB40-41 1941-45	12-5"/25
		BB40-41	56-40mm/40-20mm
		BB42 1945	32-40mm /32-20mm
		AG128 1948-56	6-5"/38 2-5"54 8 40mm
			2 MKI terrier BW-0/1 SAM twin launchers
Protection:		Main (wl) Belt/ Incline	13.5-8.0"/0
		Deck Total/Decks	5.5"/3 decks
		Turret:	18"face 10"side 9" top 9" back
		Total Armor Weight	9,972 tons
Catapults/Aircraft		1941/1942-1945	2/1 cats 4/2 aircraft
	AG128	1950-1956	0 cats/0 aircraft

Battleship USS New Mexico BB40 Call Letters: **NEVN**

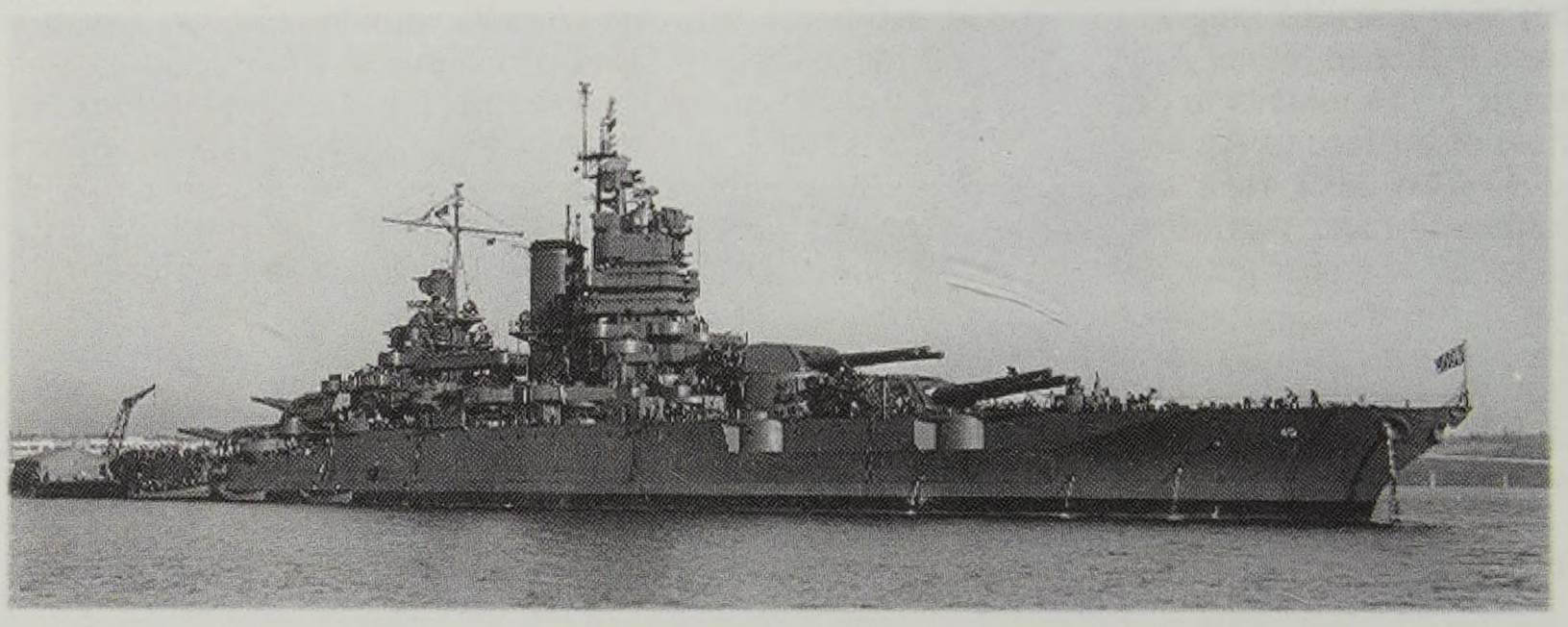
Builders Yard	New York Naval Shipyard Brooklyn NY		
Modernizing Yard	Philadelphia NSY 1931/33		
Modernizing Yard	Bremerton NSY 1943		
Modernizing Yard	Bremerton NSY 1943		
Reserve Group	Boston NSY (1946-1947)		
Scrapping Yard	Lipsett Co. Camden NJ		
Ordered:	Keel Laid	Launched	1st Comm
20 Oct 1914	14 Oct 1915	23 Apr 1917	20 May 1918
Decom	Stricken	Sold	Scrap
19 Jul 1946	25 Feb 1947	9 Nov 1947	24 Nov 1947

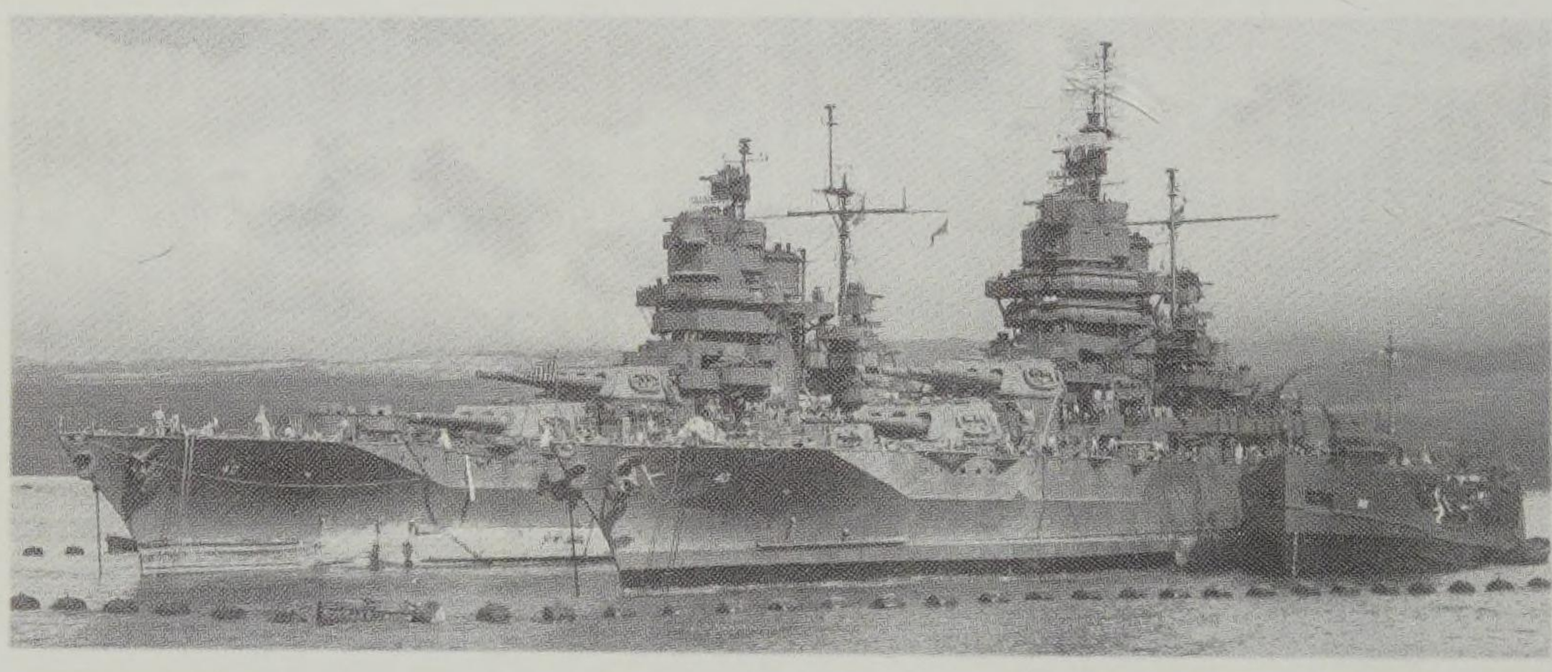
Active Service Years: 28.2



USS New Mexico BB40 Dec 1941 Ms12 (modified)

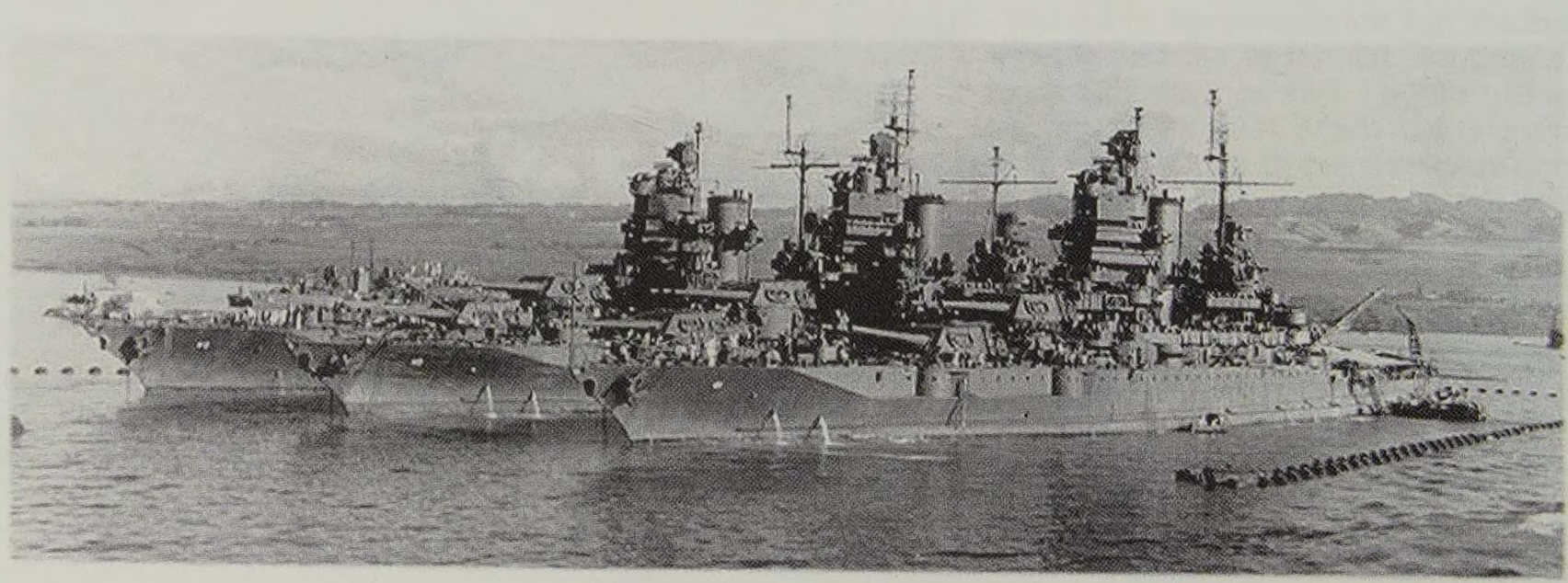
Right: 6 Oct 1943 Puget Sound NSY. BB40 after completion of overhaul. BB40 is illustrative of the appearance of the BB40 class 1942-1944. In late 1944 early 1945 a stack cap was added to the 3 ships of the BB40 class. Paint is Ms21. All three BB40 class ships wore Ms21 1942-1943.





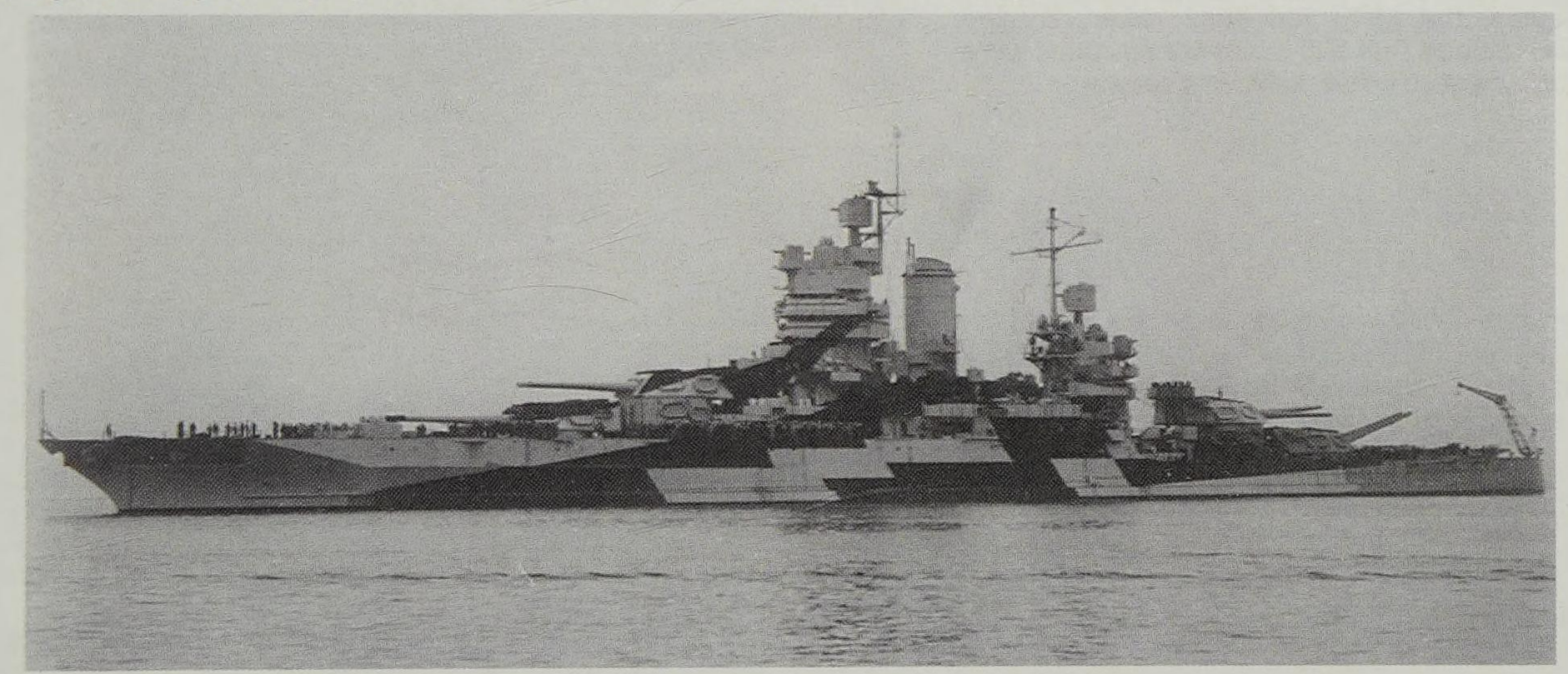
Left: 7 Dec 1943 Pearl Harbor. BB40 (R) and BB42(L). Alongside is a YOG Yard Gasoline Tanker. Note the lack of forward signal yardarms unique to the BB40 class ships. All signal hoists were flown on the mainmast.

Right: 15 Dec 1944 Pearl Harbor. (LtoR) BB42 BB40 and BB41. Note BB41 carries an SK set mounted atop the mainmast. BB40's SK is atop the foremast, while BB42 retains an SC set atop the mainmast. The ships are preparing to support the Marshall Island Assault Force. Note the anti torpedo net floats in the background and foreground.

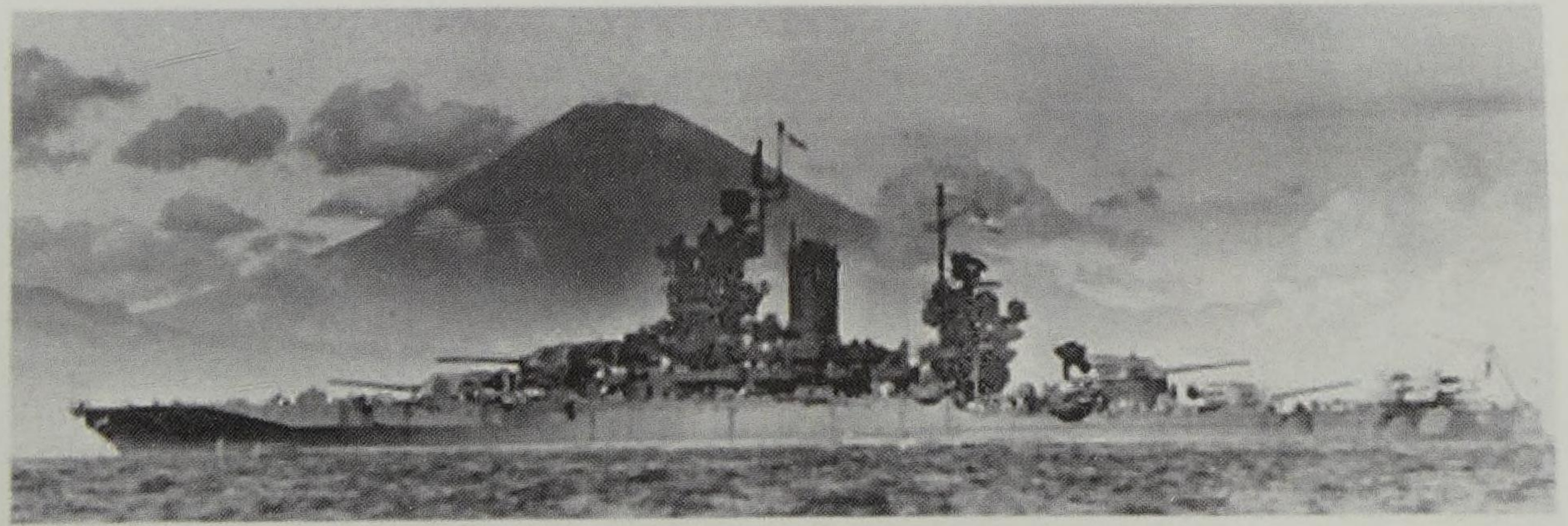


above: USS New Mexico BB40 Philippines Islands Nov 1944. Forward of the ship is an approaching LCVP with a pilot destined for the bridge to guide the battleship thru the maze of coral heads and rocks. The ship is painted Ms32/6d.

Below: 1 Oct 1944 off Puget Sound NSY. BB40 wearing Ms32/6d, BB41 also wore Ms32/6d during this time period the two ships could be differentiated from one another by BB40 mounting an SK air search atop the foremast which was shipped atop the mainmast on BB41. Secondary armament has changed little from prewar configuration. In late 1944 the casemates on BB40 were removed, and the light AA battery augmented during an AA upgrade in preparation for the scheduled Oct 1945 invasion of Japan.



Below: 29 Aug 1945 Sagami Bay off Tokyo Bay Japan. BB40 in a Navy Gray Ms21. Operating with TF35 the surrender and occupation task force. Mt Fujiyama, the sacred symbol of Imperial Japan is in the background. BB41 and BB42 were also present in Tokyo Bay for the surrender.

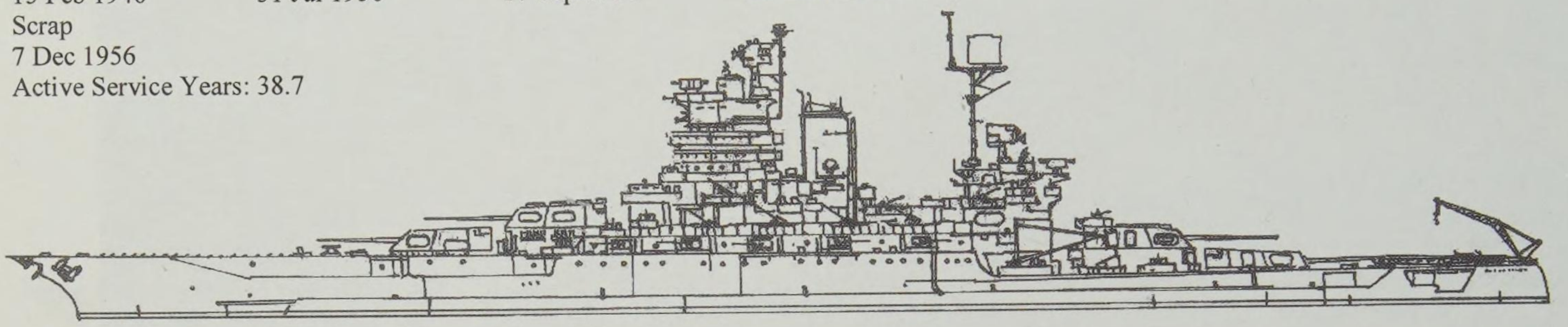


USS Mississippi BB41 AG128 Call Letters: **NEKT**

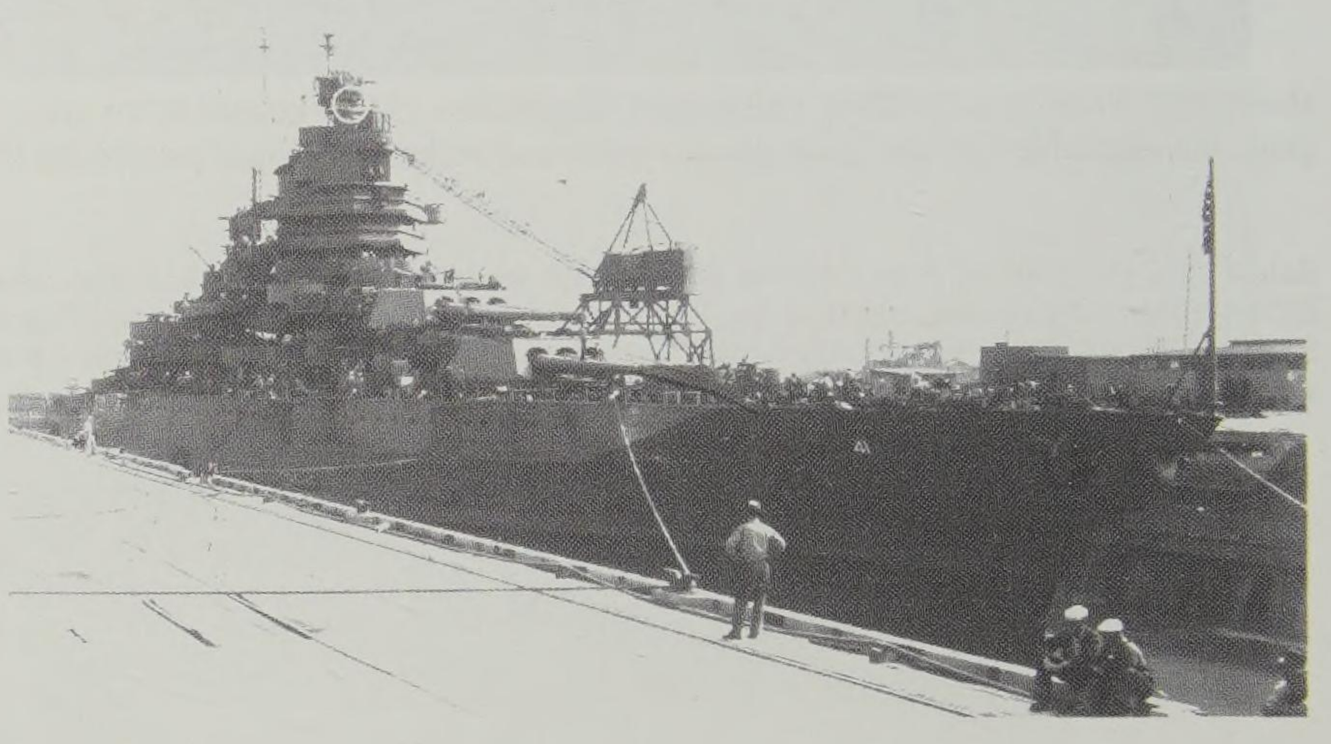
Builders Yard	Newport News Shipbuilding Co VA
Modernizing Yard	Norfolk NSY 1931/32
Modernizing Yard	Bremerton NSY 1943
Modernizing Yard	Bremerton NSY 1944
Modernizing Yard (AG)	Norfolk NSY 1947/48
Modernizing Yard (AG)	Norfolk NSY 1952/53
Scrapping Yard	Bethlehem Steel Co. Baltimore MD

Ordered:	Keel Laid	Launched	1st Comm
23 Nov 1914	5 Apr 1915	23 Apr 1917	20 May 1917
To AG128	Decom	Stricken	Sold
15 Feb 1946	31 Jul 1956	17 Sep 1956	28 Nov 1956

Scrap
7 Dec 1956
Active Service Years: 38.7



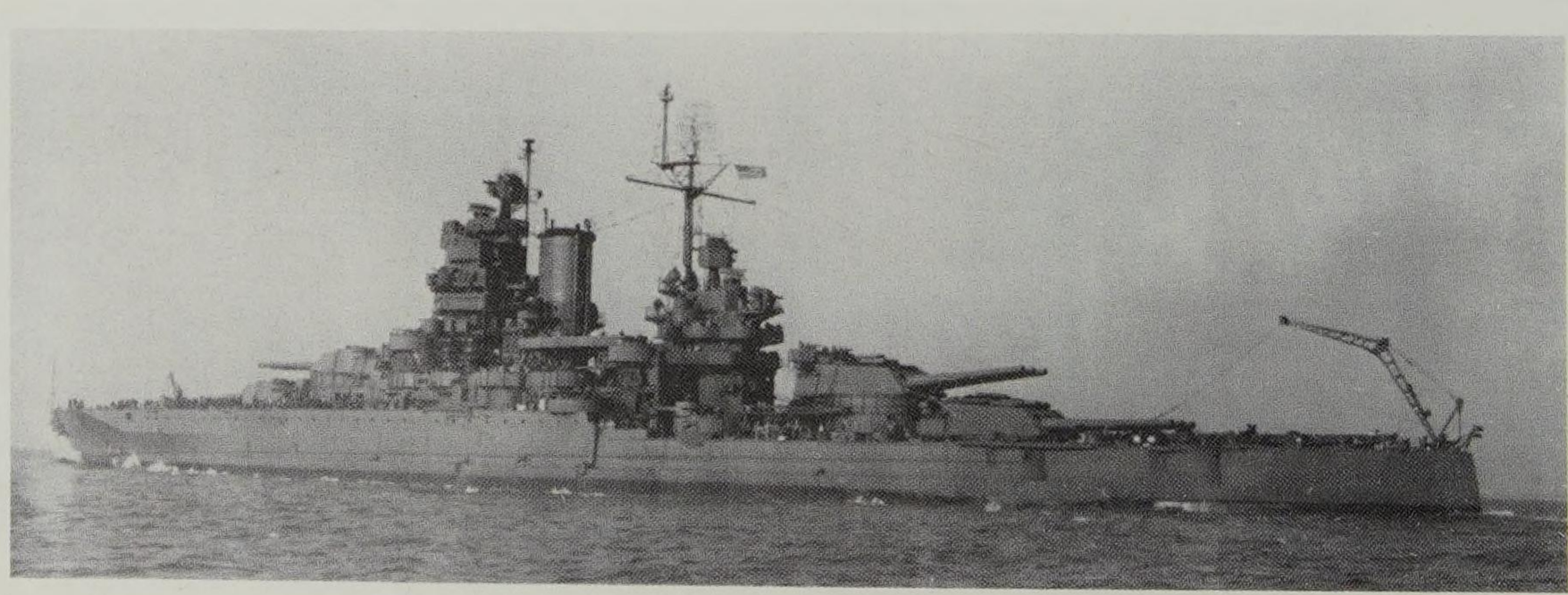
USS Mississippi BB41 Ms32/6d Oct 1944



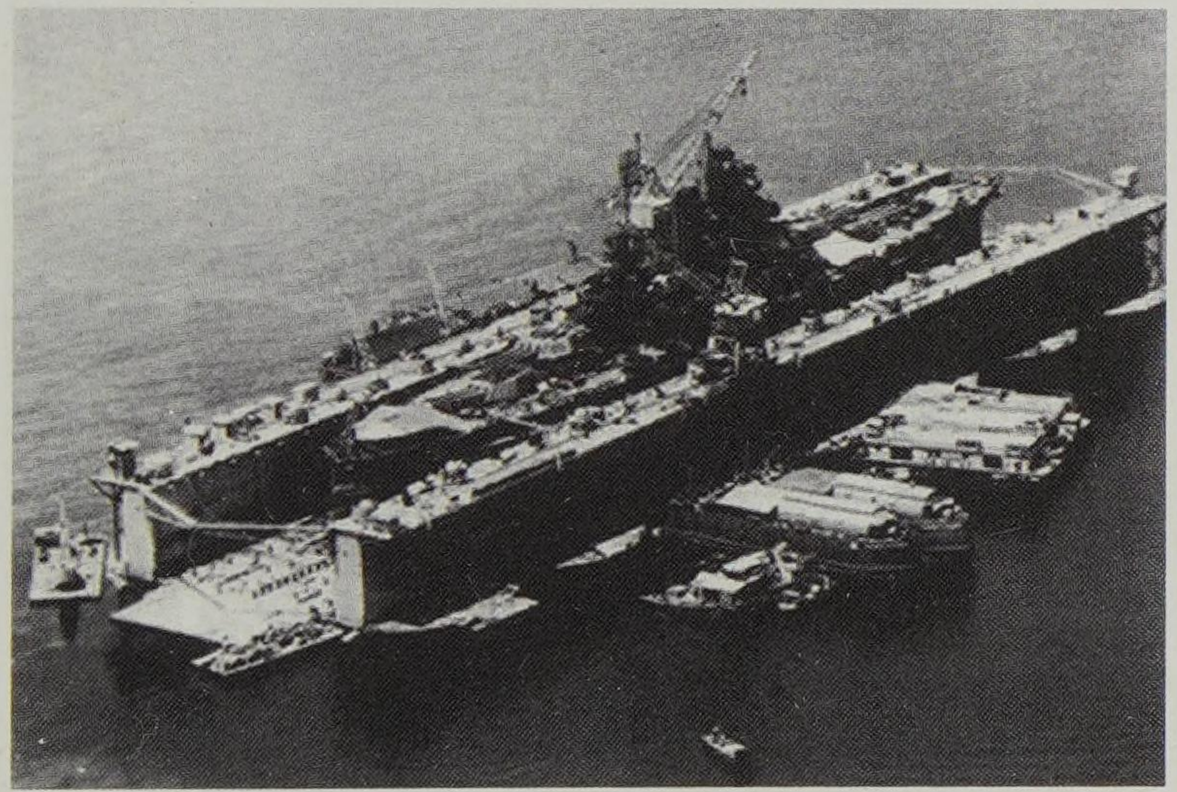
Right: 8 Oct 1943. Hunters Point NSY. BB41 during the undocking process, note the drydock is filling with water. Note the plated over casemate positions on the foreword hull area. These positions only mounted guns in the BB41 as commissioned, the BB40 and BB42 never received them as it was realized that hull casemate positions were to prone to being wet to be workable in a seaway.

Left: 8 Oct 1940 off Hunters Point NSY. BB41 after undocking and in the process of being transferred to a finger pier to complete the ship's overhaul and preparations for deployment. Note the antiquated steam powered USN YT type Yardtug.

Right: Nov 1943 Hawaiian Islands Operating Area. BB41 en route to Pearl Harbor to join sisters BB40 and BB42, for operations in the Marshall Islands Group. Note the "flying platform" 20mm gun gallery abaft the stack. USN ships normally fly the national ensign on a gaff on the mainmast when underway. The Battle Colors are flown from a gaff on the foremast

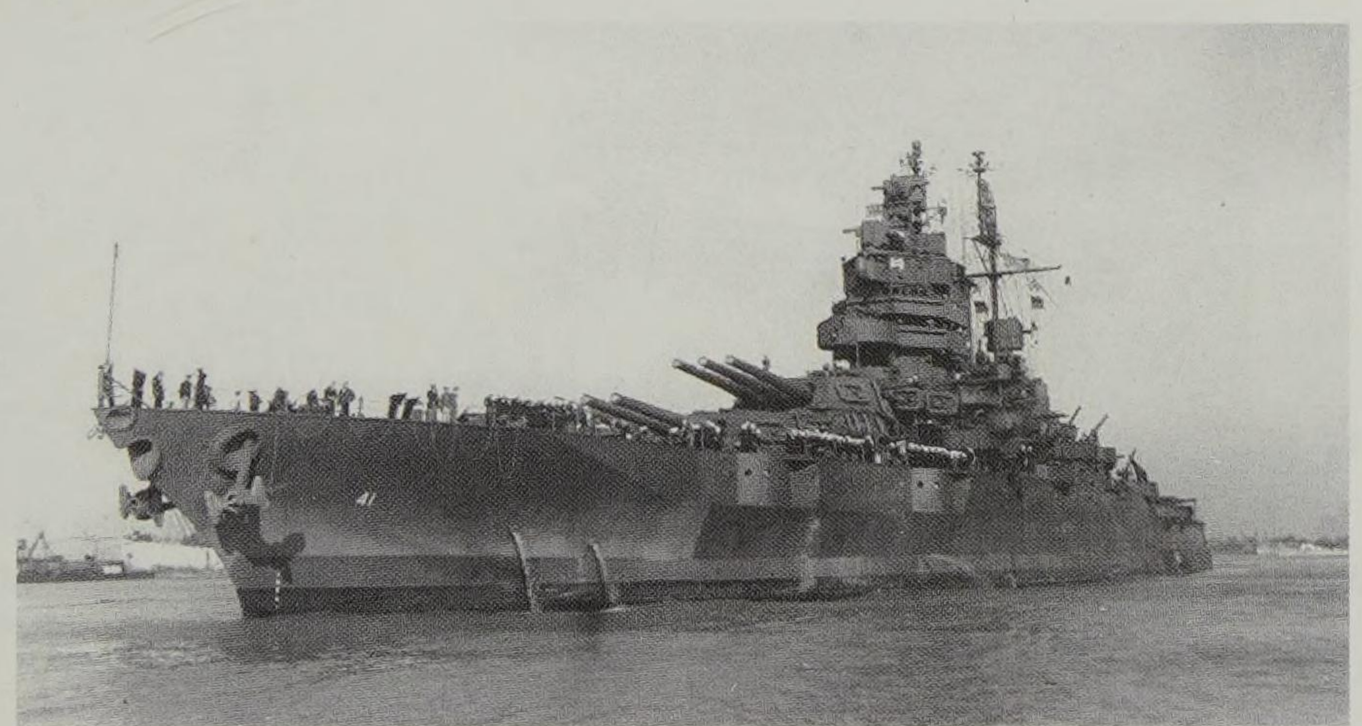


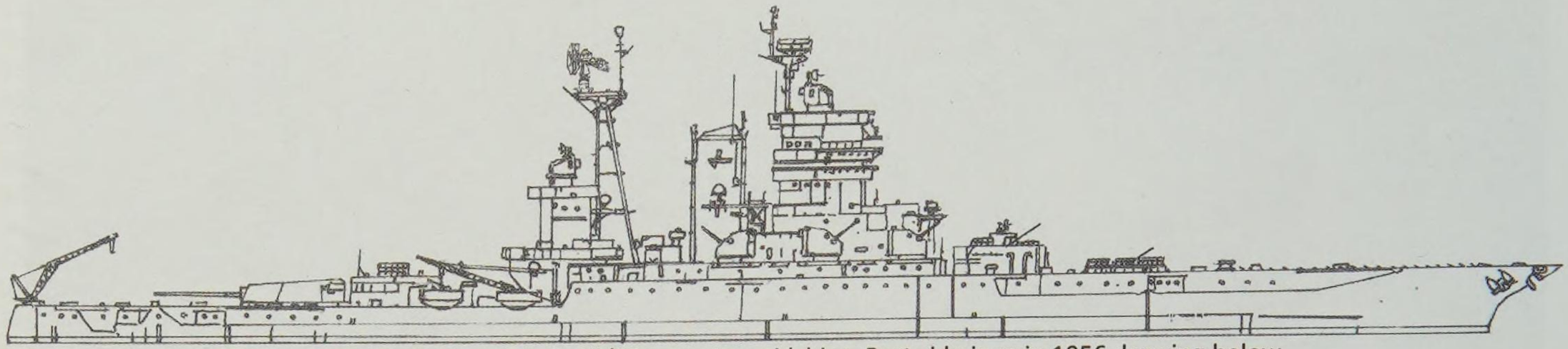
USS Mississippi BB41 at an Advanced South Pacific Base at Manus Island in the New Guinea Archipelago Oct 1944. Floating drydocks, and the myriad of repair and support ships that comprised advanced bases enabled the USN to repair and maintain ships in forward areas. The repair ship is the USS Delta AR9. The heavy work load of the floating drydocks required operations 24/7 to meet the schedules for completing urgently required repairs to return damaged ships to the fleet in minimal time.



Left: Oct 1944 Manus Islands. BB41 in ASBD2. BB's often had to offload fuel in order to reduce the ship's draft enough to clear the end sill on a floating drydock. Note the awing over the fantail of the ship is dyed a blue gray color. The barges at right angles to the dock housed shop and storage areas require for the ship repairs and maintenance. The 'advanced base' concept enabled the USN to maintain a higher level of operational availability of ships than the Japanese Navy.

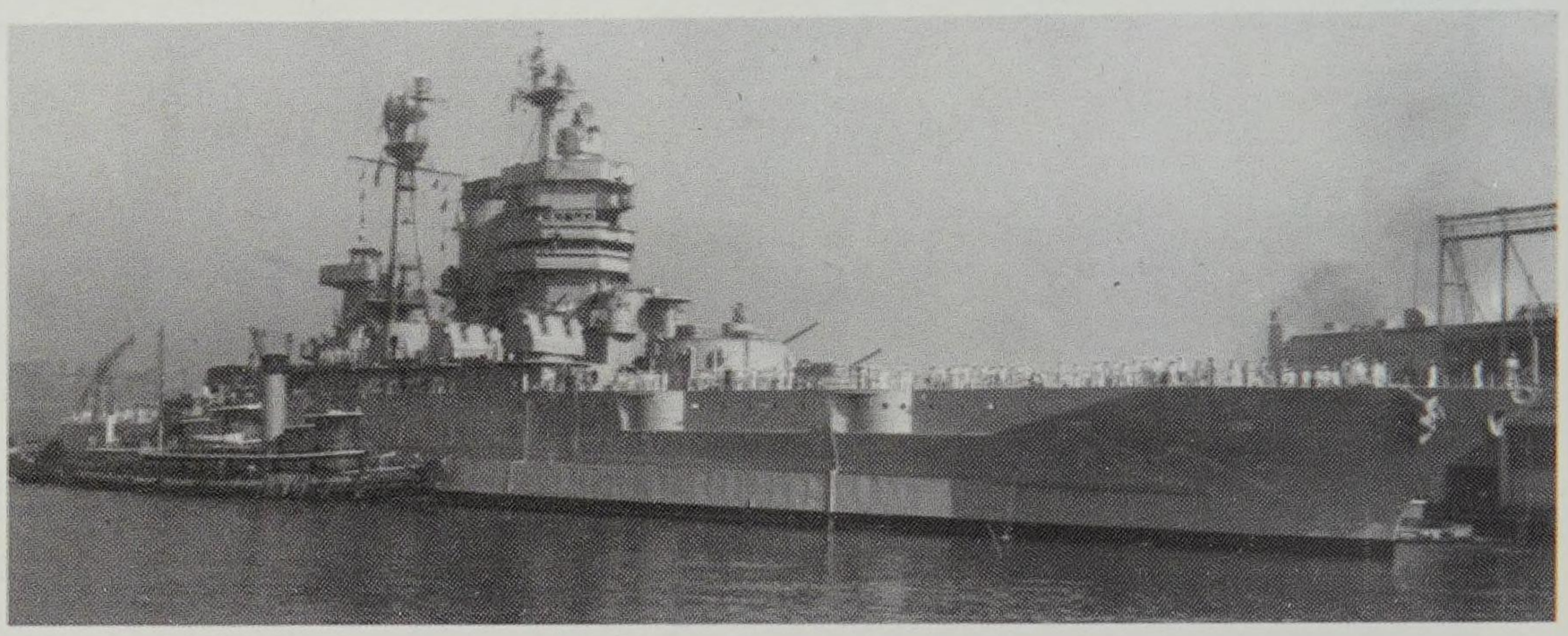
Right: 16 Oct 1946 Mississippi River. BB41 en route to New Orleans LA for the 27 Oct 1945 Navy Day celebrations. BB41 is riding high at standard displacement configuration to reduce the ship's draft, enabling BB41 to navigate upriver. The ship is painted Ms21.

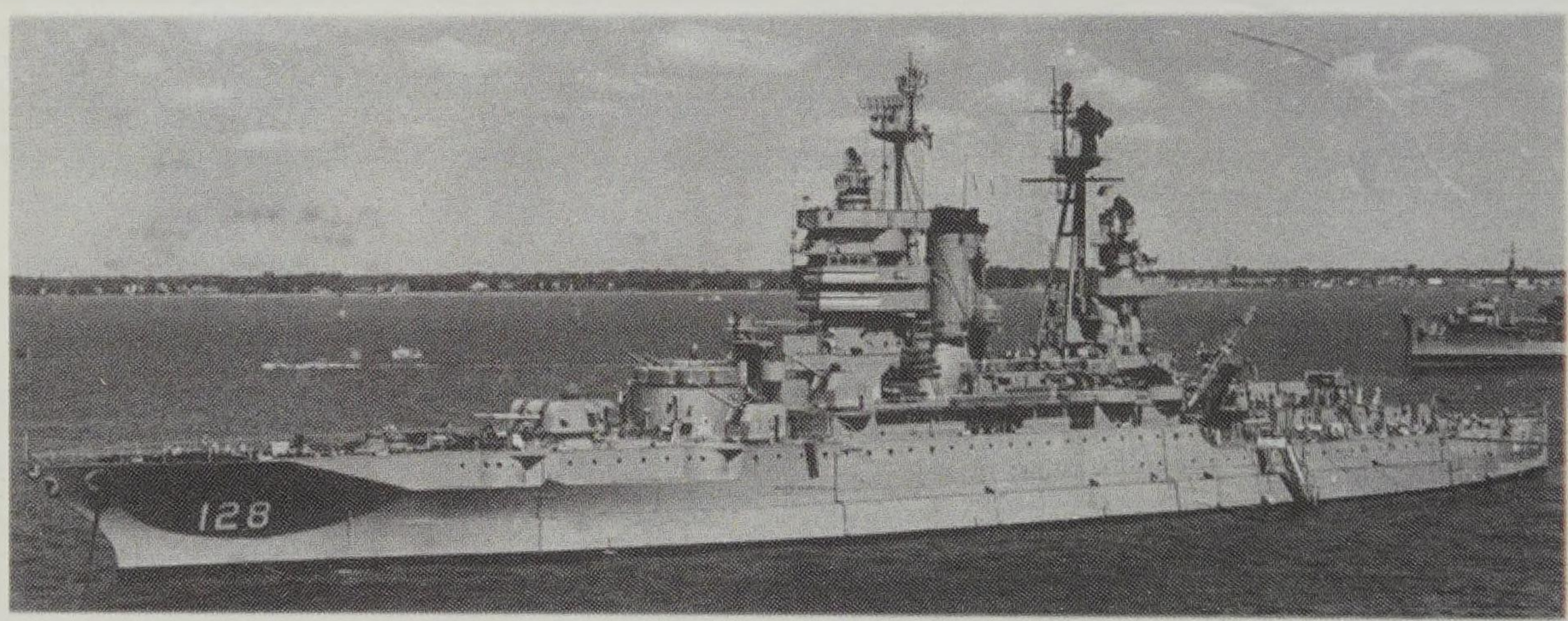




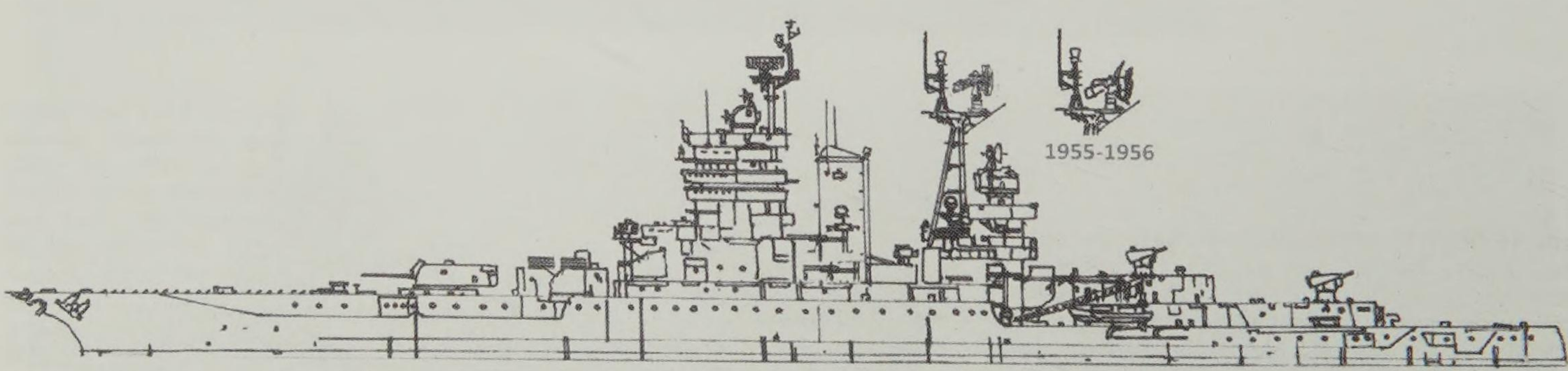
USS Mississippi AG 128 Jan 1950 Ms13. Note 3 twin 5"/38 mounts amidships. Port side is as in 1956 drawing below.

Right: 28 Oct 1949 New York Harbor. AG128 berthing with the assistance of a civilian tug. The USN regularly employed the services of civilian tug and towing companies outside of USN bases. Note the Mk10 FC radar atop barbette 2. Paint is Ms13 with small unshadowed hull numbers. AG128 had a Mk37 director with a Mk25mod0 radar added atop the after fire control tower in Jan 1950.



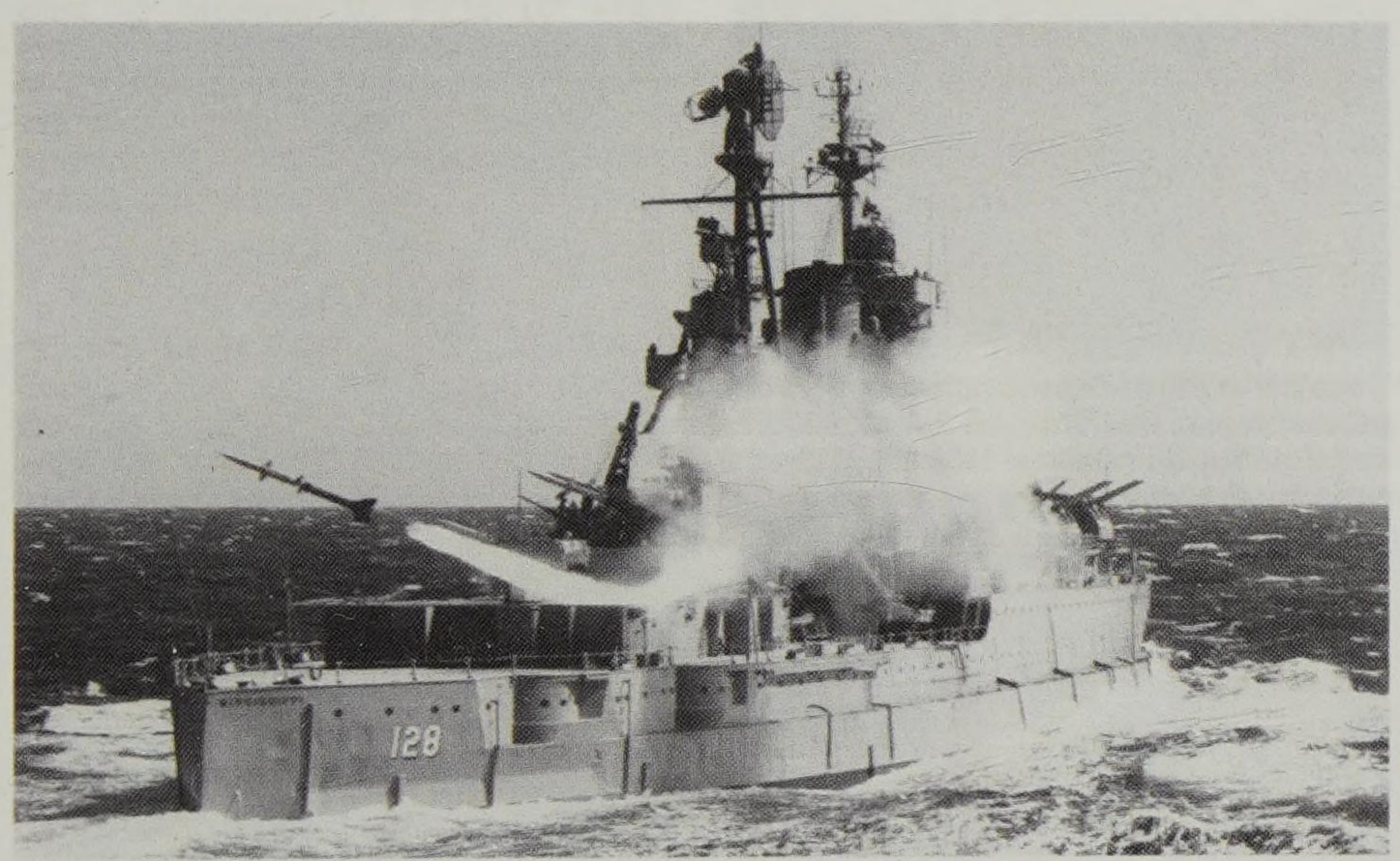


Circa 1954 AG128 Hampton Roads VA. Note the MkI BW-0 series Terrier Missile launchers, the type SX Height Finder/Air Seacrch atop the tripod mainmast, the AN/SPS6 on the foremast, Mk37mod0/Mk25mod0 director atop the fire control tower, with a Mk37mod1 with a Mk25mod7 fire control director for missile control aft. Note the 5"/54 single mounts forward with one mounted on the maindeck abaft the barbette 2. An automatic twin 6"/47 is fitted to turret 1's barbette. The ship is painted Ms13 the standard postwar Haze Gary scheme with 6' hull numbers. dbc

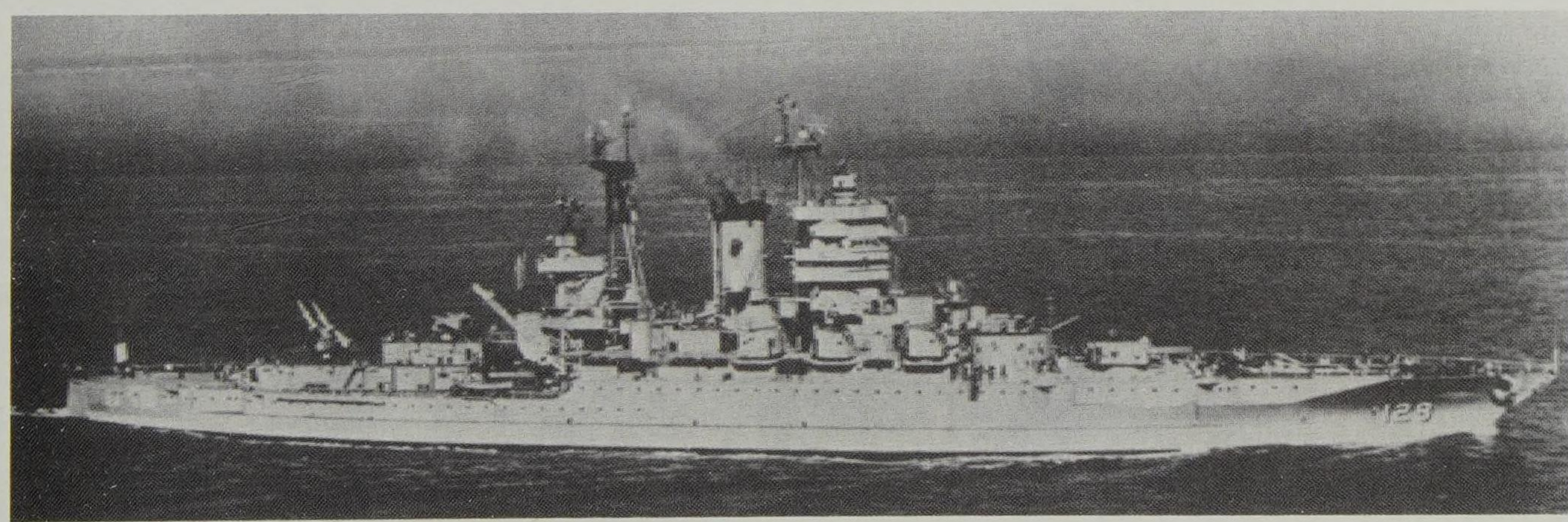


USS Mississippi AG128 Jul 1956 Ms13 Note the 2 single 5"/54 mounts on port side. Stbd is as in 1950 drawing above.

USS Mississippi AG128 (ex-BB41) Gunnery Test Ship, off the Virginia Capes Jan 1953. In mid-1947 the Mississippi assumed the gunnery testing and evaluation functions from the retiring USS Wyoming AG17. In the background, operating in support is the escort carrier USS Sicily CVE118. AG128 continued to function as a AA/missile test and evaluation ship operating out of Norfolk VA until decommissioned in Aug 1956. When the ex-seaplane tender USS Norton Sound AVM1 (ex-AV11) assumed "at sea' missile systems test and evaluation. While AG128 was never intended for operation duty, it certainly would have made a powerful warship capable of providing escort services with both gun and SAM AA capability.



Left: 28 Mar 1955 off VA Capes. AG128 fires a BW-0/1 Terrier from rail 1 of launcher 2. Note the hull blister, former after hull casemate positions. The Radar atop the mainmast is a type SX, an early 3D type that actually used a separate azimuth and elevation antennas on a single rotating assembly. AG128 was the only USN BB type to deploy the SX. Note also the stepped hull blister, the white, and black shadowed hull number and ship's name in black letters on the stern counters.

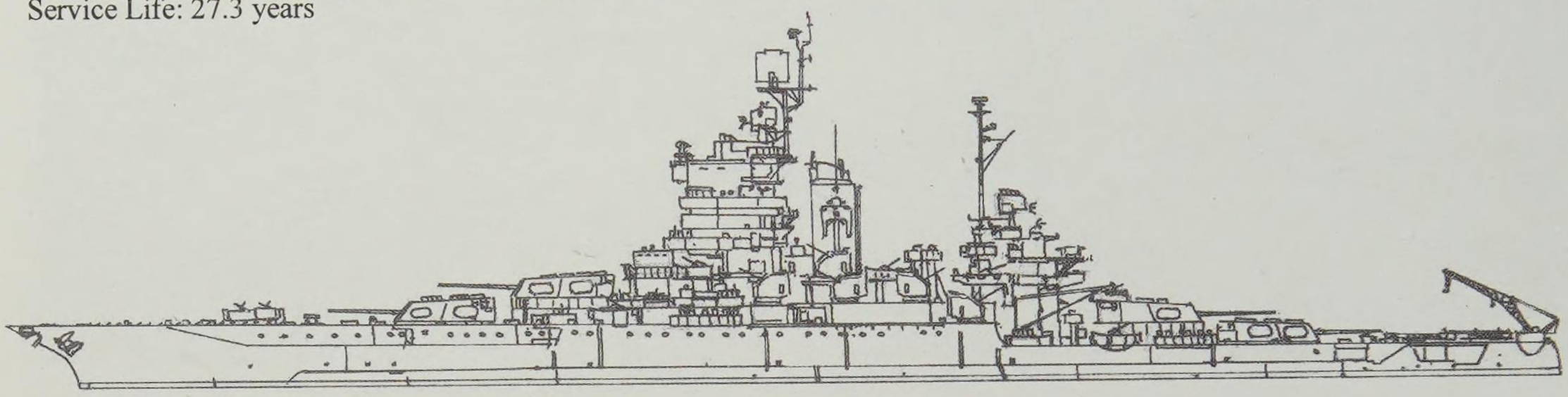


Above: Feb 1955 AG128 off the VA Capes. Note the Mk37mod1 missile director with Mk25mod7 radar mounted atop the after tower. The tops of masts and stack caps were painted Dull Black in peacetime on Ms13 and the prewar Ms3 so as to not show soot from stack gasses.

Battleship USS Idaho BB 42 Call Letters: **NAVX**

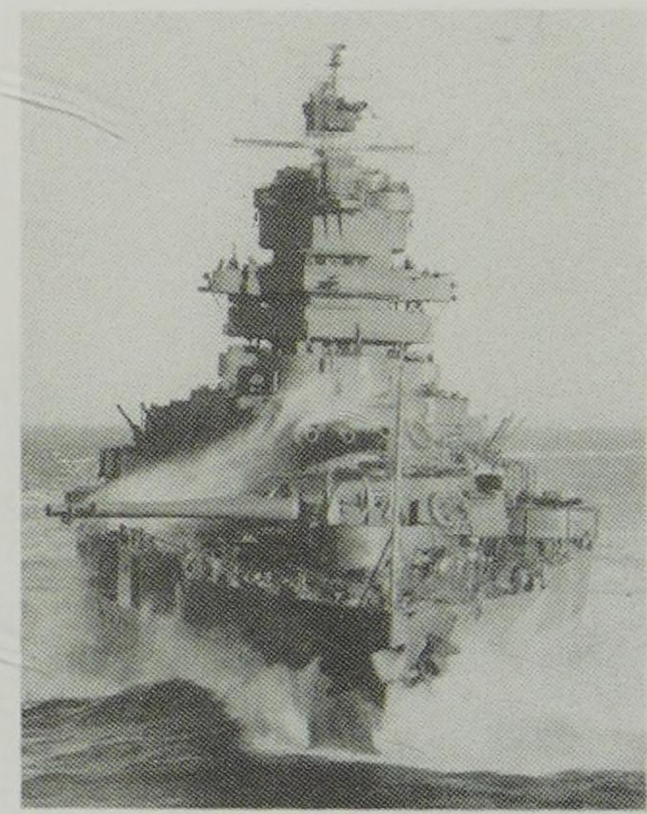
Builders Yard	New York Naval Yard Brooklyn NY		
Modernizing Yard	Norfolk NSY 1933/34		
Modernizing Yard	Bremerton NSY 1942		
Modernizing Yard	Bremerton NSY 1945		
Reserve Group	Norfolk NSY (1946-1947)		
Scrapping Yard	Lipsett Co. Camden NJ		
Ordered	Keel Laid	Launched	1st Comm
9 Nov 1914	20 Jan 1915	30 Jun 1917	24 Mar 1919
Decom	Stricken	Sold	Scrap
3 Jul 1946	16 Sep 1947	24 Nov 1947	12 Dec 1947

Service Life: 27.3 years

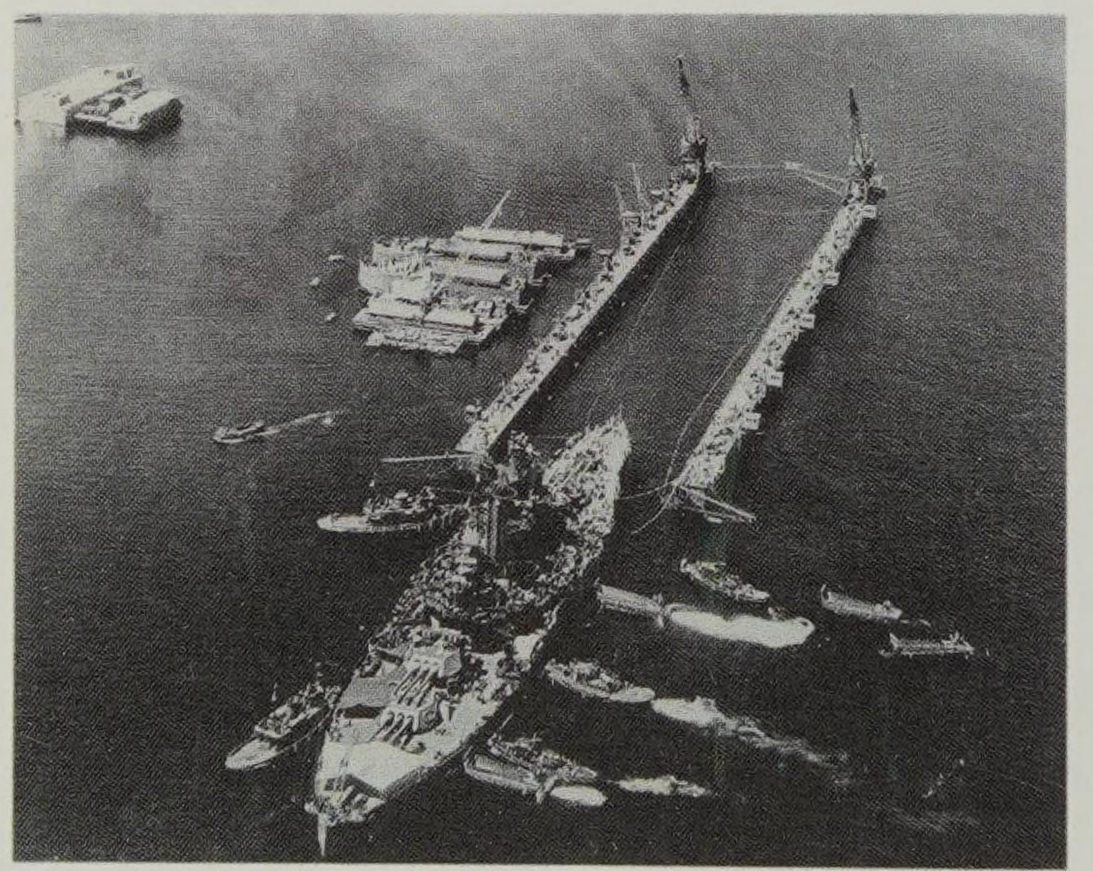


USS Idaho BB42 Apr 1945 Ms21

Above: Oct 1941 Reykjavik Iceland. On 7 Jul 1941 BB42 supported the US preemptive occupation landings on Iceland. Greenland (part of Denmark) had been occupied by the US on 9 Apr 1941.The US military occupation of Iceland and Greenland lasted for the duration of WWII . Note the catapult atop turret 3 and the heavy boat cranes abaft the stack both of which were removed at Norfolk NSY in Jan/Feb 1942 prior to transferring to the Pacific. The ship is wearing a variant of Ms2.

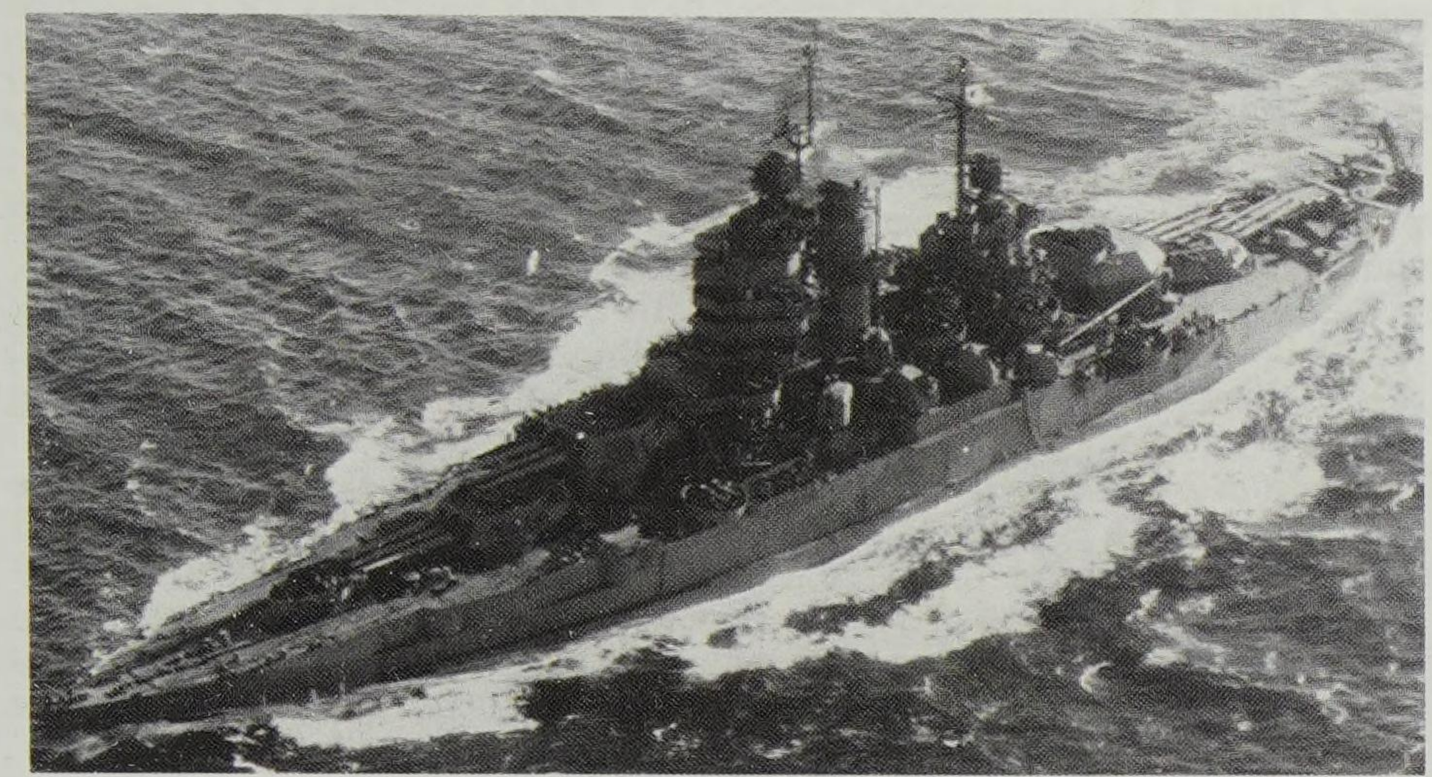


Above: Jan 1944 off Kwajalein. BB42 operating in heavy seas while providing fire support to forces ashore. dbc

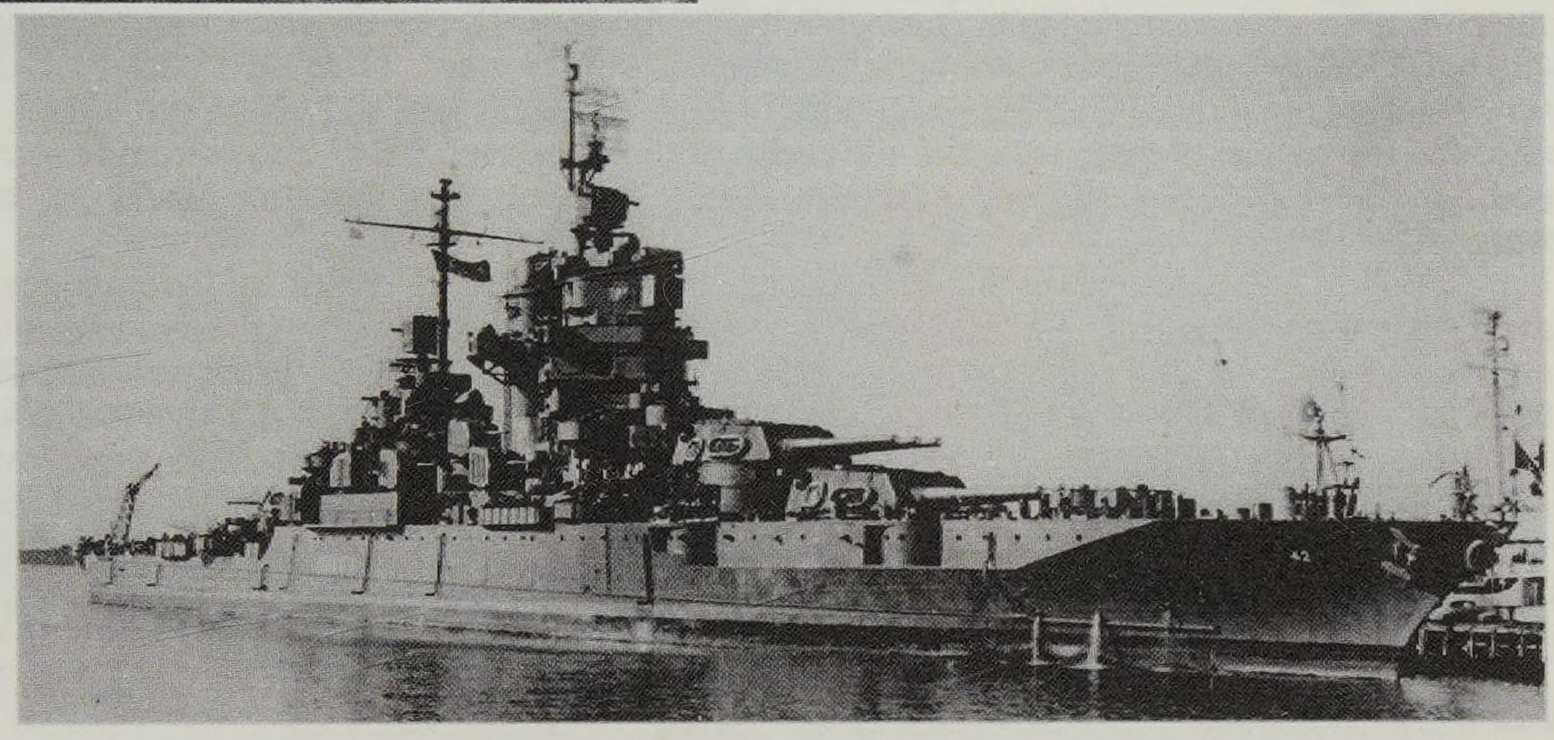


Above: 15 Aug 1944 Espirtu Santo New Hebrides Islands. BB42 entering ASBD1 for repair to torpedo blisters due to grounding off Guam. Note the LCVP's being used as tugs to position the ship. Docking a ship in a drydock called for precision positioning require tolerances of less than 1 foot to maintain the stability of the dock when the ship was raised.

Below: 2 Jan 1945 Puget Sound NSY. BB42 after completion of overhaul, and modernization of the heavy AA battery. BB42 is in Ms21. BB42 did not wear a Ms31/32 pattern as did BB40 and BB41.



Left: 2 Jan 1945 Puget Sound. BB42 on post overhaul trials and shakedown. Note the stepped arrangement of the new 5"/38 DP AA battery. Note also the massive medium and light AA installed as part of the AA upgrade program for operations during the anticipated invasion of the Japanese Islands scheduled to start in Oct 1945. Note that the Mk31 directors with Mk10 radars have been retained. BB42 was the only BB to receive a 5"/38 DP battery and not be refitted with Mk37 directors.



Oct 1945 BB42 Norfolk NSY. The ship's name is painted in 6' white letters amidships. This practice was applied to some ships returning from the Pacific and/or participating in Navy Day 27 Oct 1945, celebrations, and were removed by Dec 1945. BB42 was the only of the BB40 class to received 10 5"/38 DP single mounts in late 1944. The ship is riding high in the water suggesting ammunition and supplies have been removed in preparation for beginning the deactivacation process.

"Dawns Early Light" USS Idaho BB 42 off Mt Suribachi Iwo Jima 24 Feb 1945. BB42 providing precision 'call fire' support. Atop Mt Suribachi flies the American flag. BB42 is camouflaged Ms22, with an unpainted natural teak wood decks. The aircraft are SB2C Helldivers from the USS Yorktown CV10. In the background is the volcanic Mt Suribachi which was honeycombed with tunnels and hidden gun positions that were able to fire and hit any point on the island, making the land battle for Iwo Jima one of the costliest of the Pacific War.

Tennessee Class: 2 Battleships of 1915:

USS Tennessee BB 43 USS California BB 44

The Tennessee class were the by now standard incremental improvements of the preceding BB40 class, they were the first class of USN BB's to have completely clean hull lines with no provisions fore and aft for hull mounted casemate positions. The BB43 class were the first ships of what was to become the "Standard Type" of USN BB design concepts comprised of the BB43, BB45, and the canceled BB49 class ships. The following 3 16" armed Colorado class ships together with the 2 14" armed BB43 class ships formed the mainstay of the USN Battlefleet from 1921-1941, and were collectively known prewar as the "Big Five".

In early 1942 after sustaining minor damage from 2 bombs at Pearl Harbor. BB43 received the first of two wartime modernizations. The aft cagemast was removed and replaced with a medium height tower structure with a pole mainmast stepped aft of the number 2 stack. "Pacific Fleet" splinter shields were added to the 5"/25 heavy AA batteries. In late 1942-early 1943 BB43 received an extensive modernization that resulted in the ship being almost as modern and capable as the new 3rd generation BB's except for the limiting factor of speed. The hull received 5' wide torpedo bulges with internal bulkheads on either side. This increase in beam precluded the ability of the ship passing thru the Panama Canal. The catapult was removed from turret 3. The entire existing superstructure including the stacks, the cagemast and aft tower were removed and replaced with a 'pyramid type' superstructure with a single squat stack flared into the forward fire control tower topped with a Mk34/Mk8 director. A tall tower with a Mk34/Mk8 main battery director was fitted aft of the stack. Four Mk37/Mk4 DP directors in a diamond pattern disposition were fitted. 16 5"/38 DP's in 8 twin gunhouses were stepped fore and aft on the 01/ 02 levels. With the exception of the clipper bow, and the two level maindeck, the silhouette of the converted BB43 class strongly resembled the South Dakota BB57 class. As modified the BB43's were good seaboats, steady in seaway, stable gun platforms, but somewhat slow to respond to helm commands.

BB44 was damaged and sunk during the Pearl Harbor attack by 2 torpedoes and 3 bombs. BB44 was refloated and given temporary repairs in the spring of 1942. Prior to refloating the aft cagemast was removed and the foreword cagemast removed in drydock and replaced with a polemast foremast. The casemate guns and the heavy AA battery were removed and replaced with eight .50 cal MG's in the former guntubs for the heavy AA battery. The catapult was removed from turret 3. The ship was never operational in this condition, and retained it only to transit under ship's own power in the autumn of 1942 to Puget Sound NSY for an almost identical modification as was applied to BB43. As modified these two ships plus the similarly modified West Virginia BB48 provided a modern capable battleship design that could provide AA, escort, and fire support to the amphibious and auxiliary forces. Thus leaving the fast battleships classes free to support the fast carrier task forces. In 1947 both ships were placed in reserve in inactive drydock 5 at the Philadelphia NSY. In 1959 both ships were stricken and sold for scrap.

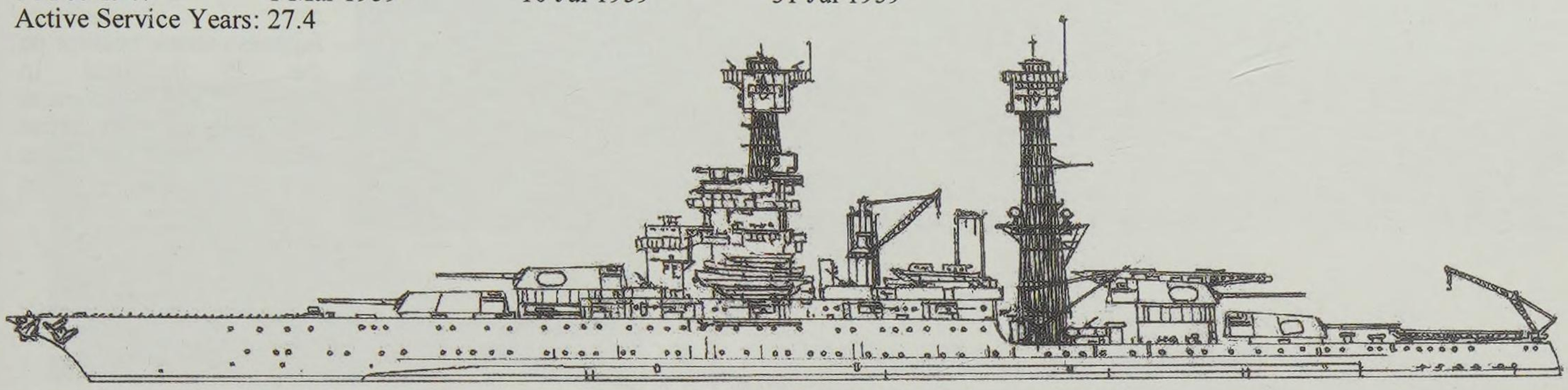
Tennessee Class Battleships Statistics

Displacement:	Std/fl 1942/43	32,693 tons/34,858tons
	Full Load: as mod	40,345tons
Dimensions:	Length WL/OA	600'0"/624' 0"
	Beam as built	97' 6" Beam 1943:114' 0"
	Draught	28' 4"
Machinery	Type:	Turbo Electric/ 4Gen
	Boilers	8 oil fired
	Shafts/designed SHP	4shafts/28,900 shp nominal
	Rudder	single
	Max Speed 1942/43	21.0 knts/20.6kns
	Weight of Eng Plnt	2,064 tons
	Fuel bunkerage/Range	4,353 tons
	Tactical Diameter	610 yds @ 20 knts
	GM	11.45
Armament:	Weight of Broadside:	24,000lbs/12.00tons
	Projectile Weight:	2,000lbs/1.00tons
	Max range:	36,300yds/20.62miles
	Rnds/weight per Min	2.0/18.0tons
	Rnds per gun/Total Rnds	100/1,200
	Main	12-14"/45
	Sec 1942/43	12-5"/51/16-5"/38 DP
	AA 1942/44	8-5"/25/
	Lt. AA 1942	4-3"/50
	Lt AA 1934-45	BB 43 40-40mm 40 20mm
		BB 44 48-40mm 40 20mm
Protection:	Main (wl) Belt/ Incline	13.5-8.0" vertical/0
	Deck	5.50"/3 decks
	Turret	18"face 5"side 10" top 9" back
	Total Armor Weight	1942/43 8,610 tons/9,972 tons
Catapults/Aircraft	1941/43	2/1 cats 4/2 aircraft

Battleship USS Tennessee BB43 Call Letters: **NIDN**

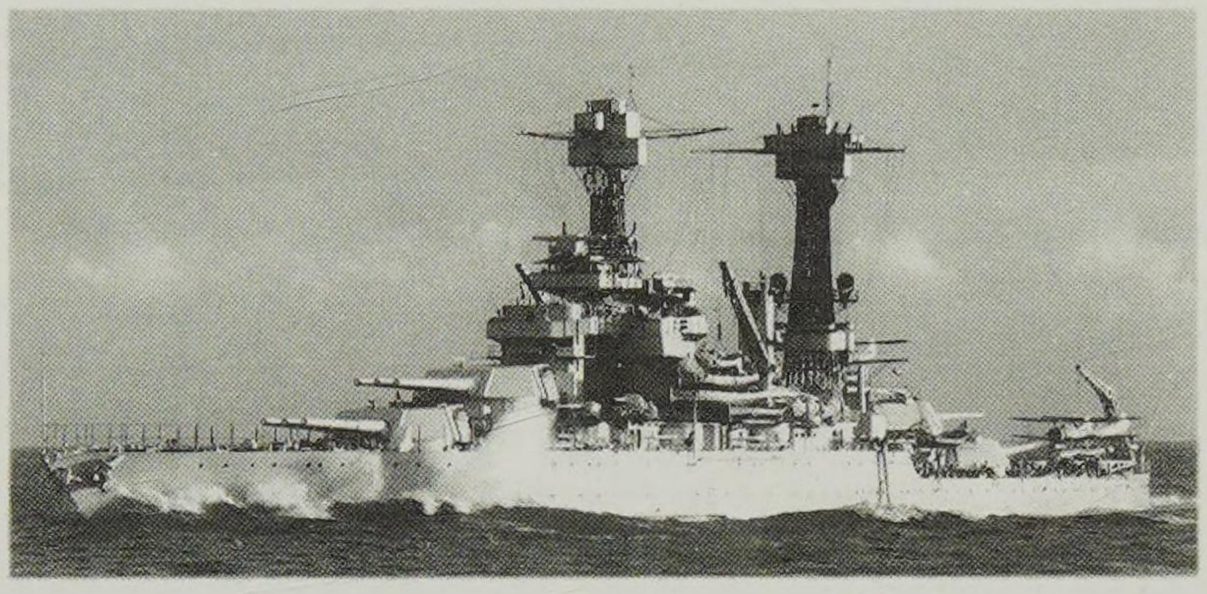
Builders Yard	New York Naval Yard Brooklyn NY		
Modernizing Yard	Bremerton NSY 1942		
Modernizing Yard	Bremerton NSY 1944/45		
Reserve Group	Philadelphia NSY		
Scrapping Yard	Bethlehem Steel Co. Baltimore MD		
Ordered:	Keel Laid	Launched	1st Comm
28 Dec 1915	14 May 1917	30 Apr 1919	3 Jun 1920
Decom	Stricken	Sold	Scrap
14 Feb 1947	1 Mar 1959	10 Jul 1959	31 Jul 1959

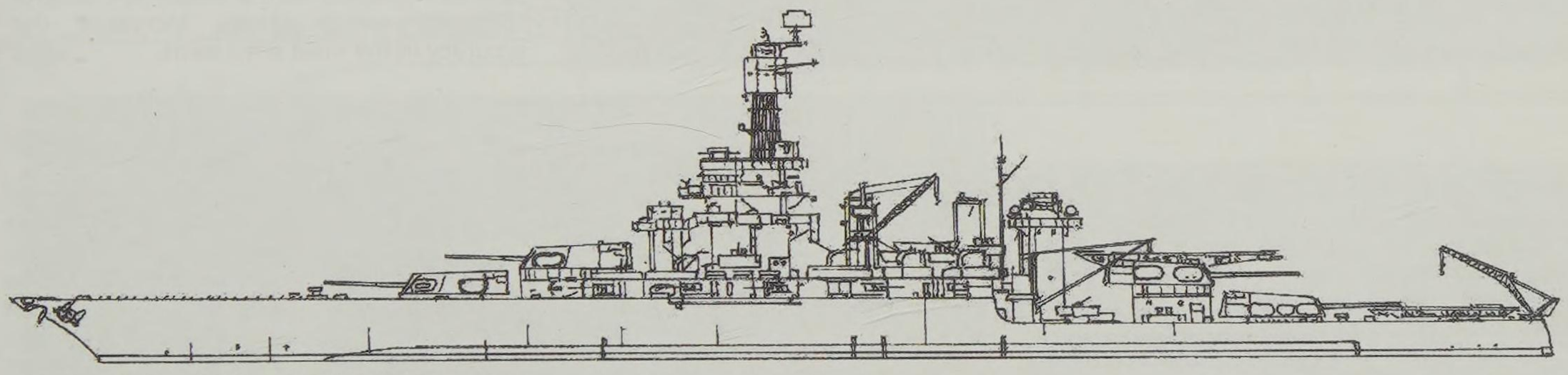
Active Service Years: 27.4



USS Tennessee BB43 Nov 1941 Ms1

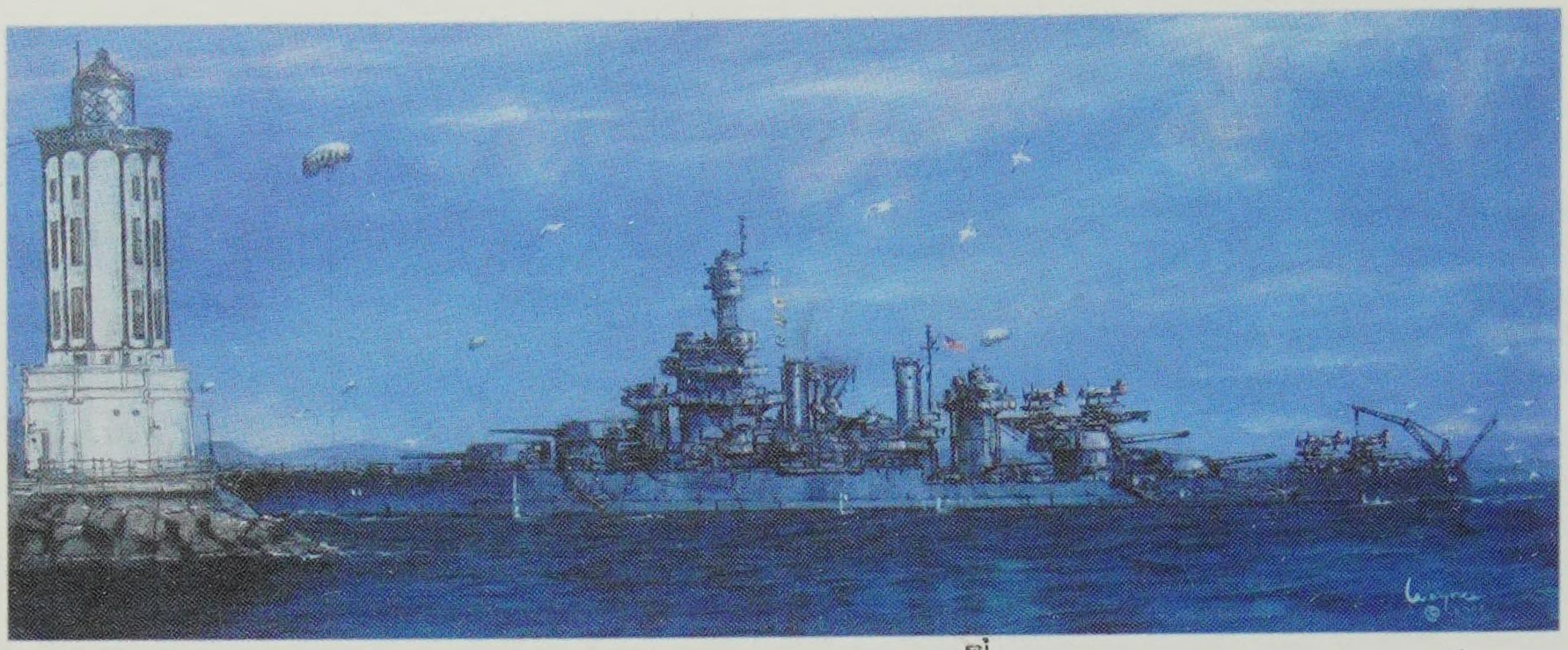
Right: Circa 1938 USS Tennessee BB43 at sea off San Pedro Ca, which was the prewar Operational Home Station for the Battlefleet from 1919-1941. While Puget Sound was the West Coast Maintenance Station for the BB's. Note the scaffolding rigged forward for an awning, the jackstaff forward, and the ensign staff aft. The BB43 and BB45 classes were scheduled to be modified similar to the BB40 class prewar. But this program was canceled in 1938 in deference to the deteriorating world situation. The ship is painted Ms3.



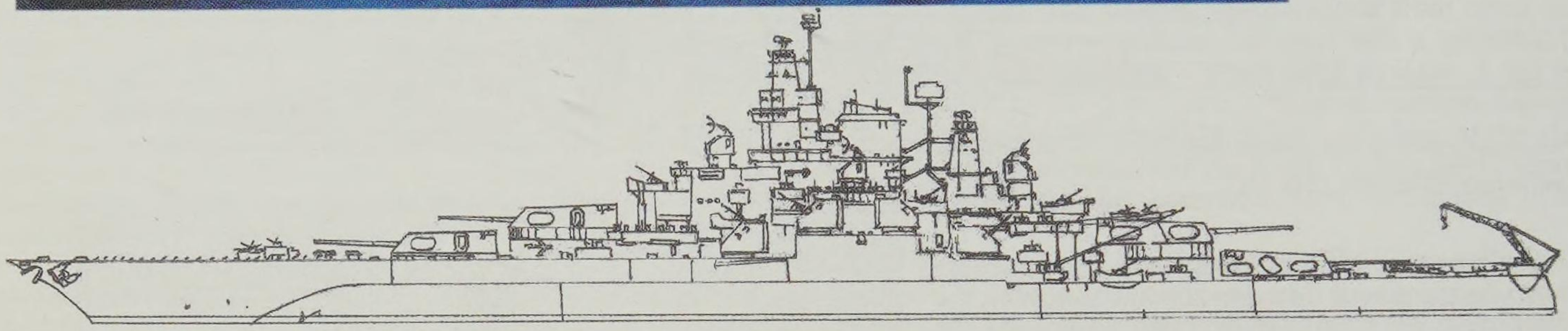


USS Tennessee BB43 Feb 1942 Ms14

Below: 26 Feb 1942 BB43 Puget Sound NSY after the ship's first modernization when the after cagemast was replaced with a tower structure. The catapult atop turret 3 has been retained, as have the heavy boat cranes abaft the forward stack. Portholes have been sealed. A Mk3 Fire control radar has been fitted atop the foretop and a CXAM1 on the foremast.



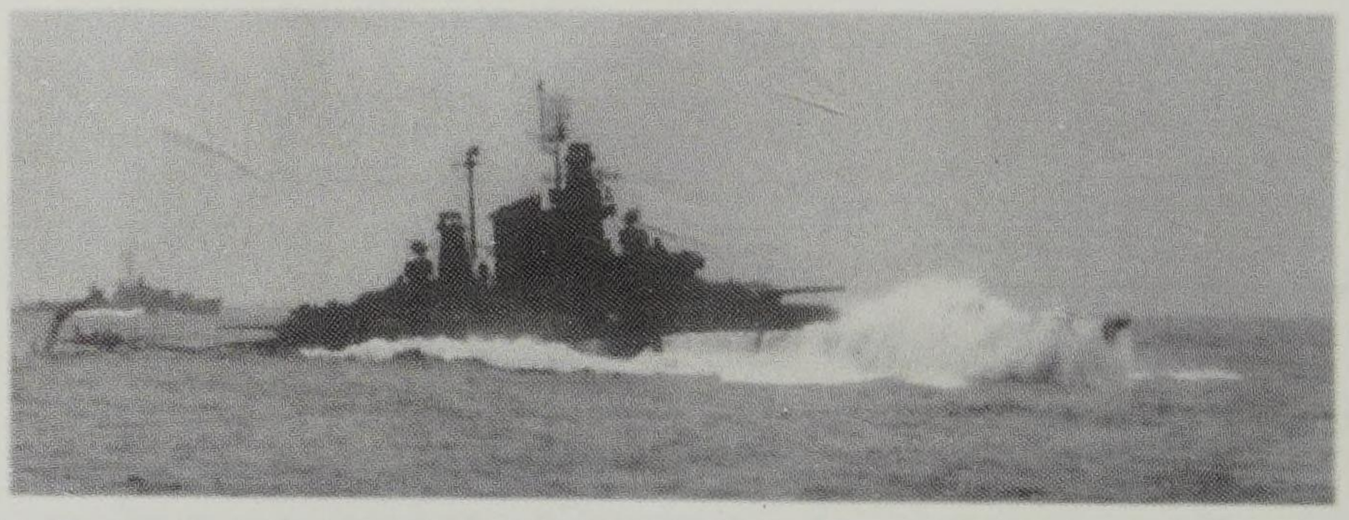
USS Tennessee BB43 March 1942 at the Long Beach Harbor entrance which is known as the "Angels Gate". In late Dec 1941 the BB's stood guard off the West Coast, and during the battle of Midway stood off Oahu ready to intervene in the event of a simultaneous Japanese attack attempt on the US mainland. In August 1942 Tennessee was released from patrol duties to enter the Puget Sound NSY for modification.

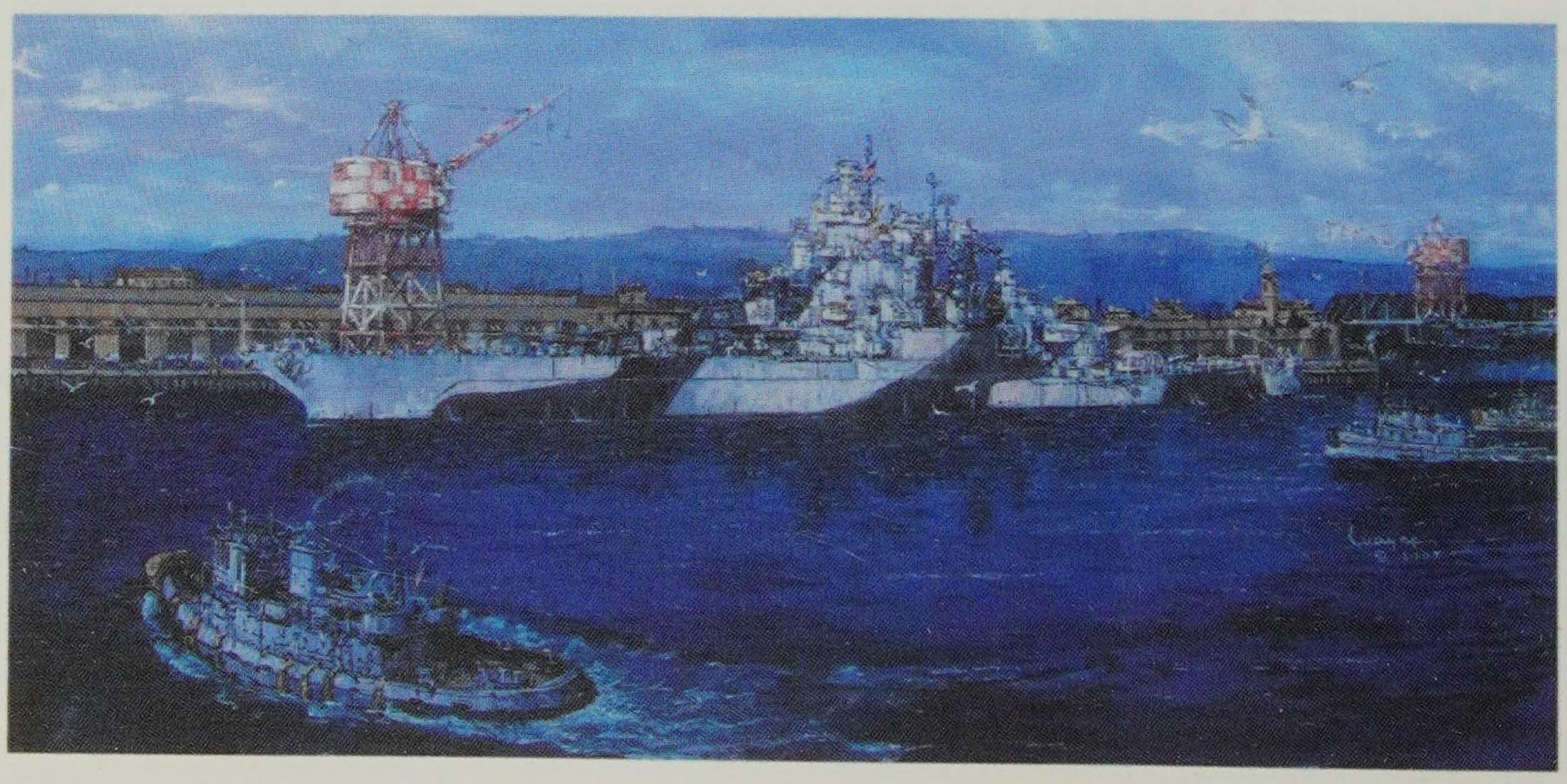


USS Tennessee BB43 Oct 1943 Ms32/1d

Left: 8 May 1943 BB43 Puget Sound NSY. Note the torpedo bulges, pyramid style superstructure, 5"/38 DP secondary armament and the massive 40mm/20mm light AA battery. An SC2 radar is fitted atop the mainmast and SG set is fitted to the foremast. The fire control systems have been updated with a Mk34/Mk8 main directors coupled with a Mk1A fire control computer which greatly increased the accuracy of the main armament.

Circa 1945 BB43 at sea taking "Green Water" over the bow. The rebuilt BB43 class were considered good seaboats and steady gun platforms. Paint is Ms21. Note the SK radar now mounted atop the foremast. In the background is a DD445 class destroyer. BB's require DD escorts for protection from submarine attack, and to assist in the Battleline by laying smokescreens and defend against enemy DD torpedo attack.



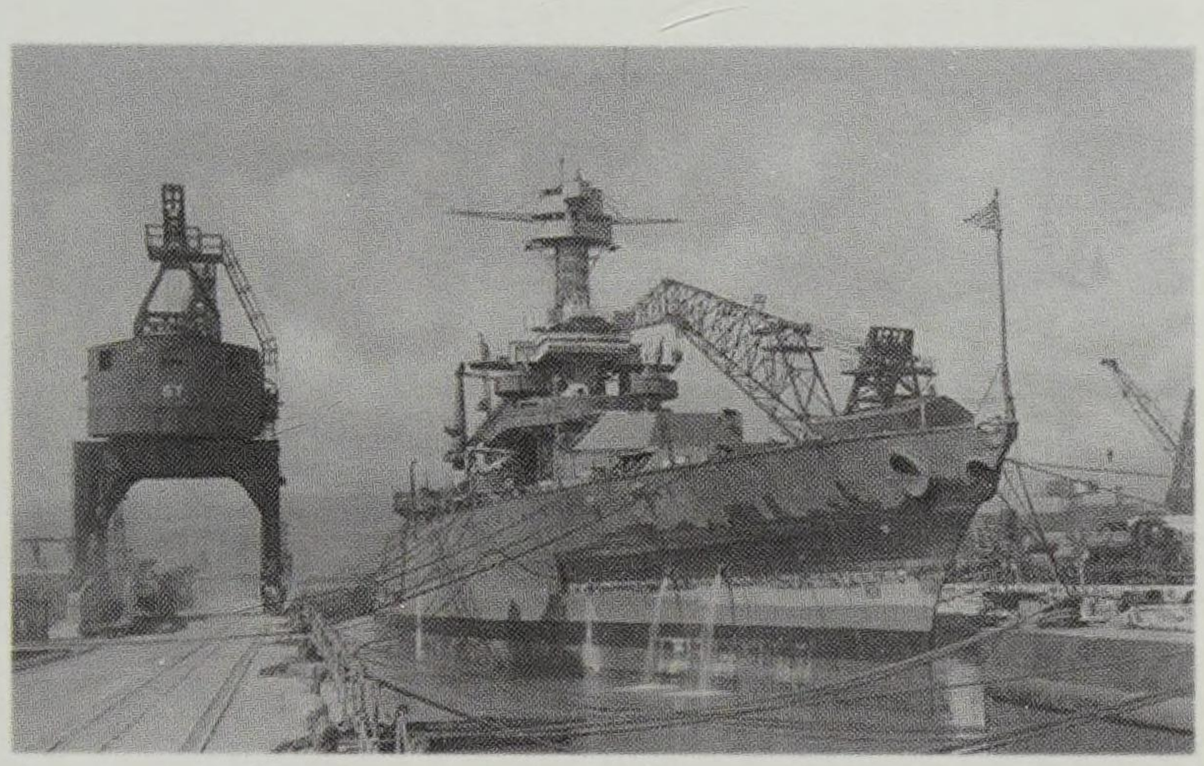


USS Tennessee BB43 NAS North Island San Diego CA in 1944 preparing to dock. BB43 is the first of the major modernizations of 2nd generation battleships completed by Puget Sound NSY. Tennessee is painted in a Measure 32/1d camouflage, The large cranes seen dockside are use to lift aircraft, ordnance, and supplies aboard ships preparing to deploy to the Pacific Theater.

Battleship USS California BB44 Call Letters: **NAFT**

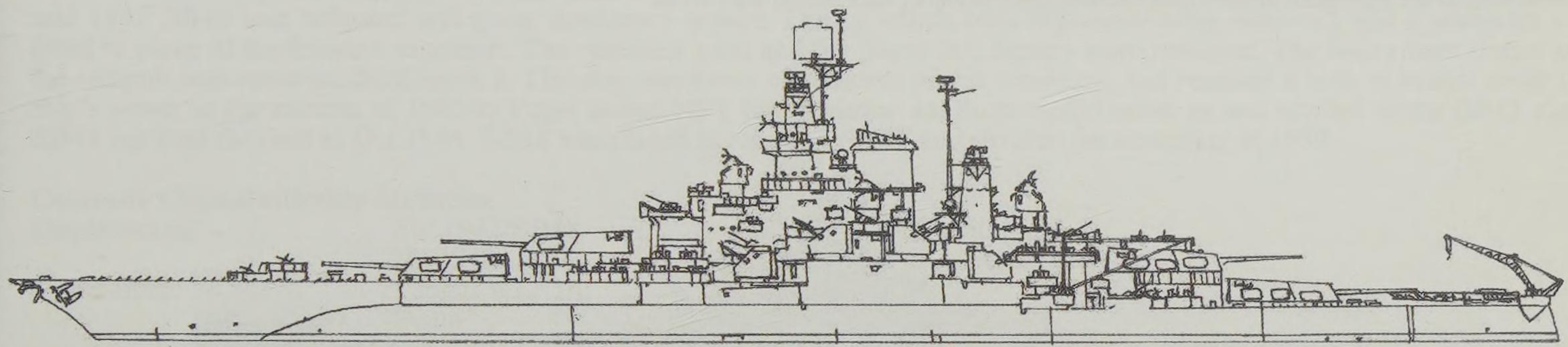
Builders Yard		Mare Island Naval Yard Vallejo CA		
Modernizing Yard		Bremerton NSY 1942		
Modernizing Yard		Bremerton NSY 1944/45		
Reserve Group		Philadelphia NSY		
Scrapping Yard		Bethlehem Steel Co. Baltimore MD		
Ordered	Keel Laid	Launched	1st Comm	
28 Dec 1915	25 Oct 1916	20 Nov 1919	10 Aug 1921	
Reserve	Decom	Stricken	Sold	Scrap
7 Aug 1946	14 Feb 1947	1 Mar 1959	15 Jun 1959	31 Jul 1959

Active Service Years: 25



Above: 7 Dec 1941 Pearl Harbor. BB44 during the attack. Note the BB44's list to port, smoke from BB39 and BB48.

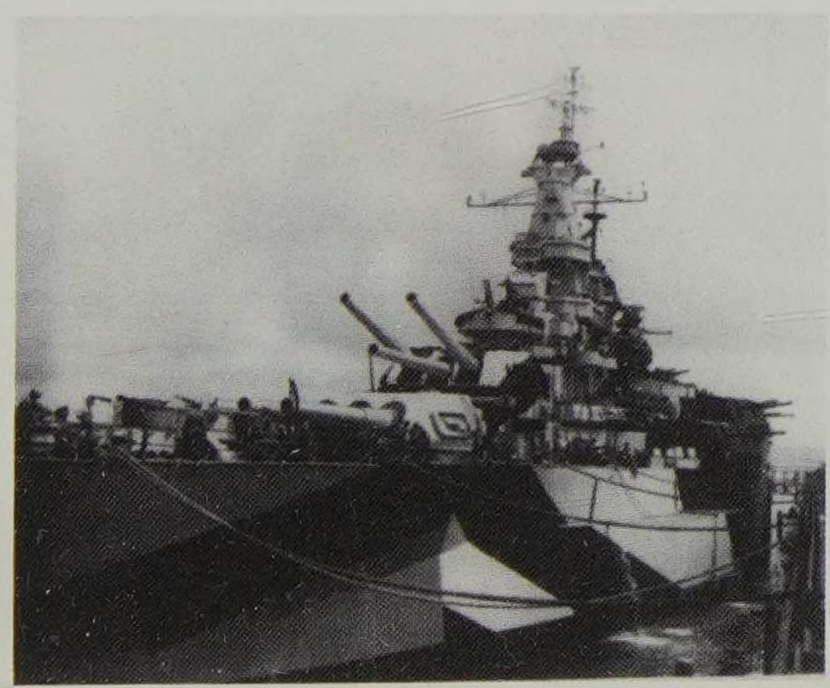
Right: 7 Jun 1942 Drydock1 Pearl Harbor. BB44 after hull repairs preparing to undock for upperworks repair and removal of forward cagemast prior to departing for Puget Sound.



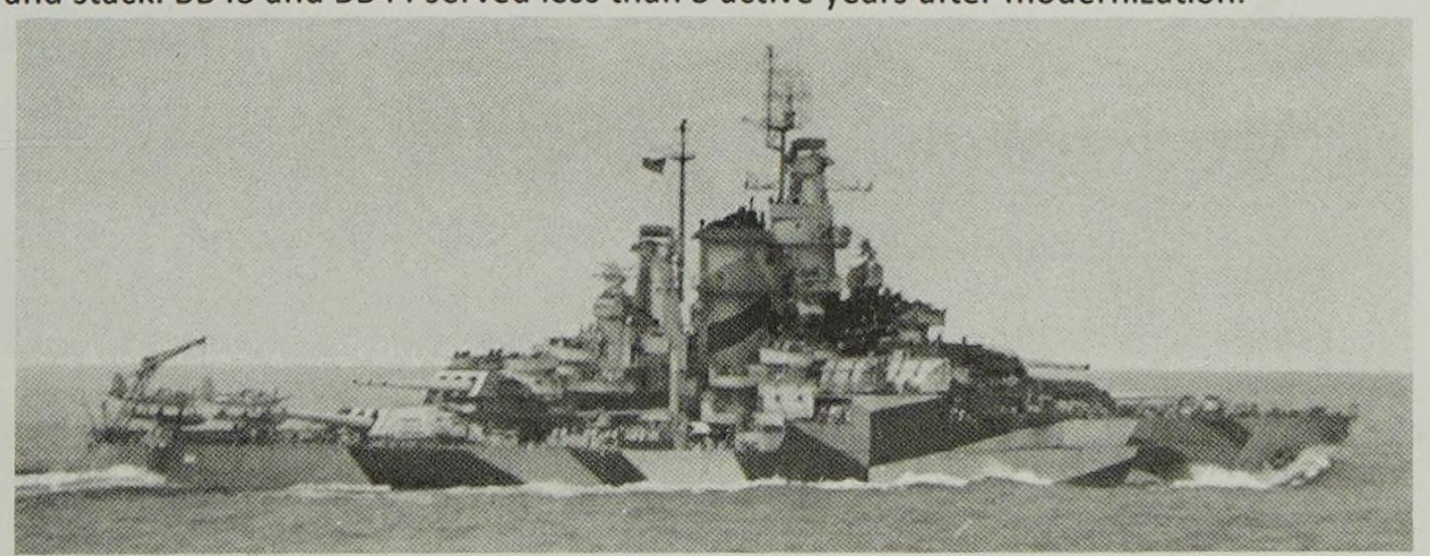
USS California BB44 Oct 1944 Ms32/16d

Right: Jan 1944 Puget Sound. BB44 underway on post modernization trials. Paint is Ms32/16d. Note the silhouette resemblance to the BB57 class. The modernized BB44/48 class ships were maintained for reactivacation until 1957.

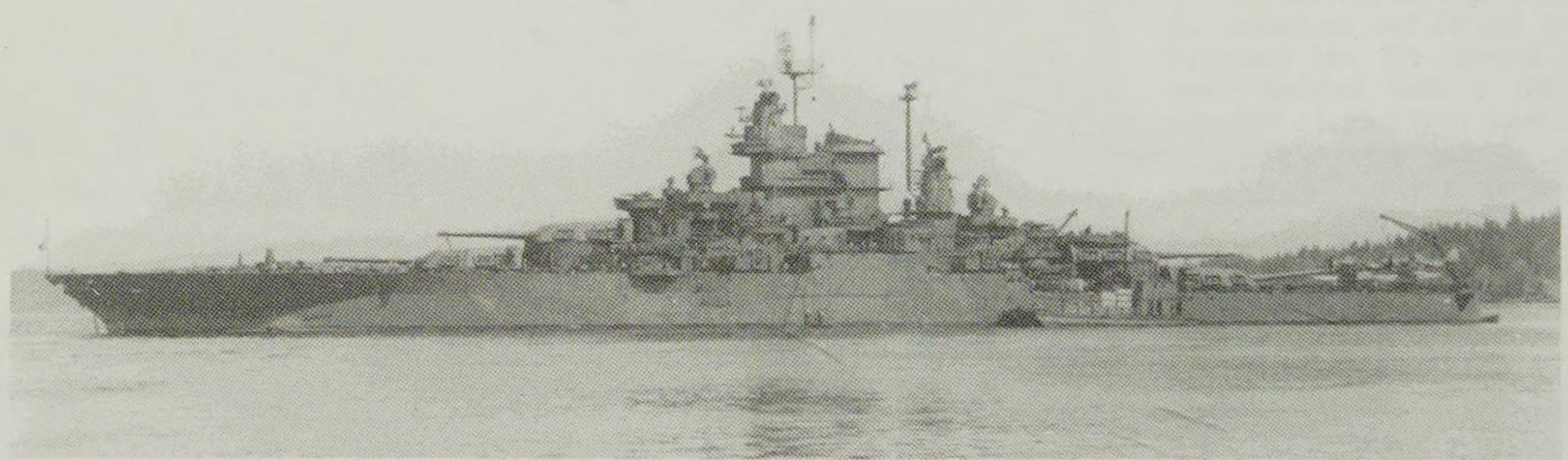
Left: 13 Sep 1944 ASBD1 Espirtu Santo BB44 undocking after repairs from collision with BB43. Repaired area is in the center of the photo on the upper hull.



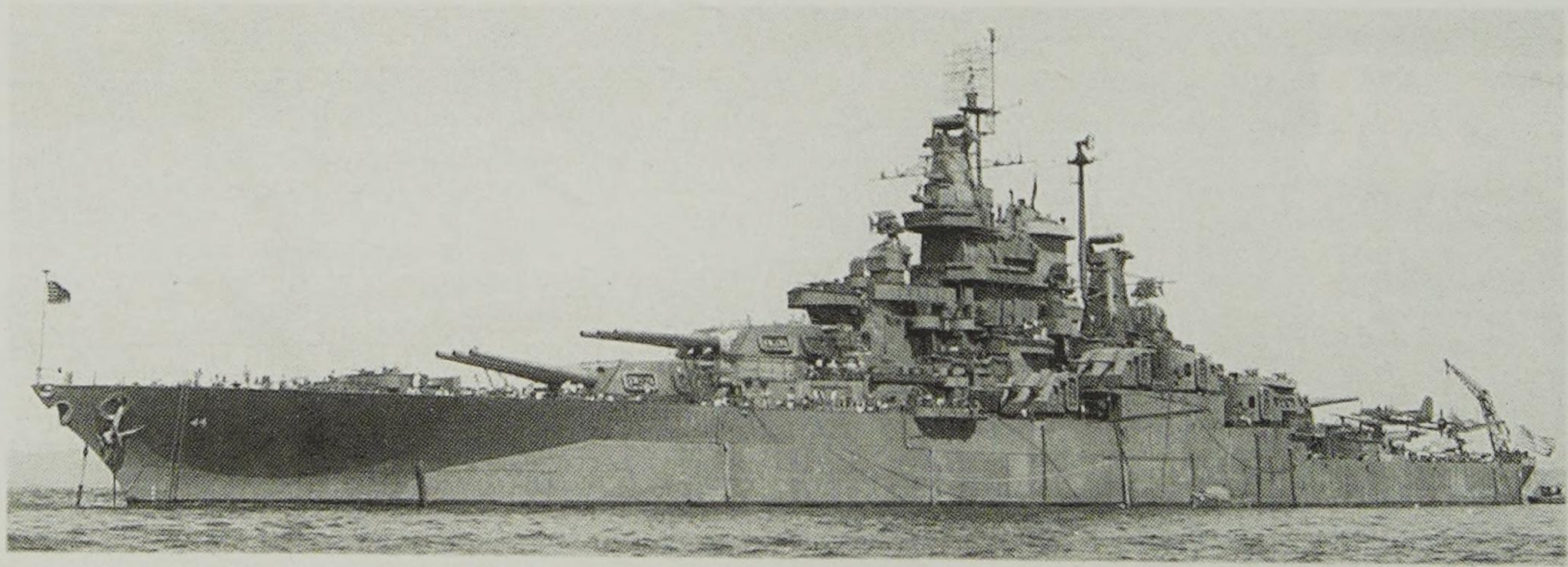
Below: circa Oct 1944 Surigao Strait BB44 underway. Note the tall after fire control tower and stack. BB43 and BB44 served less than 3 active years after modernization.



USS California BB44 off Oahu Hawaii Feb 1945. BB44 has departed Pearl Harbor bound for Puget Sound NSY for refit and repair of Kamikaze damage sustained in operations at Lingayen Gulf in the Philippines. At Pearl Harbor California was sunk by two torpedoes. In 1942 BB44 was salvaged from the mud, repaired and transformed into a powerful new design of battleship. The California returned to the Pacific Theater in Jun 1944 to help in the final push of the forces of the empire of Japan back across the Pacific.



Above: Circa May 1945 Puget Sound. BB44 at anchor during the ship's Kamikaze damage repair period overhaul. Note the stepped secondary battery and the 40mm gallery inboard of the secondary armament. Note the lines forward of the torpedo bulges which increased the ships beam to 114'. This was the BB44's final configuration. Paint is Ms21.



Circa Nov 1945 Cape Town South Africa with TG50.5 At the end of WWII , as they could no longer transits the Panama Canal with their 114' beams, BB43 and BB44 transited to Philadelphia NSY for deactivacation from the Pacific Theater via the Indian and Atlantic Oceans.

Colorado Class: 4 Battleships of 1916:

USS Colorado BB 45 USS Maryland BB 46 USS Washington BB 47 (canceled) USS West Virginia BB 48

The Colorado class ships were 16"/45 armed versions of the BB43 class. The BB45 class ships were the first design of USN battleships to mount 16" guns. (The Japanese Mutsu class had been the 1st BB's to mount 16" guns and they were also superior to the BB45 class in speed 23kns vs. 21kns). In 1939 modernizations of the BB43 and the BB45 classes similar to the BB40 class were authorized but deferred due to the developing war situation in Europe. In late 1941 BB48 had a small raked cap added on the forward part of the forward stack, and a type CXAM radar installed atop the foretop on a small cantilevered aft facing circular platform.

Thru 1942 BB45 having been absent from the Pearl Harbor attack, operated in prewar configuration with the addition of 'Pacific Fleet' splinter shield housings to the 5"/25 heavy AA battery. In early 1943 BB45 had the aft cagemast cut down to just above stack level and had a 20mm gun platform mounted atop the remaining stump. The catapult atop turret 3 was removed as were the boat cranes abaft the forward stack. BB45 also received a 'flying platform' for 20mm's abaft, and aft of the forward stack. A small raked cap was added on the forward part of the forward stack. In early 1944 the balance of the aft cagemast was removed, and replaced with a medium height tower structure. A pole mainmast topped with an SG radar was stepped aft of the number 2 stack. In 1944 a Mk34/Mk8 director was fitted atop the after tower. BB45 decommissioned in 1947 and was sold for scrap in 1959. In 1950 BB45 was authorized for conversion to a radio controlled target ship, similar in concept to AG16, for the testing of Air to Surface missiles, but due to funding restrictions the project was subsequently canceled.

BB46 was modified in 1942 in a similar manner as BB45 but retained hull portholes. BB46 was again modified in 1943 as BB45, except BB46 carried a short polemast atop the aft stump cagemast platform. BB46 did not receive an after tower structure until late 1944. Both BB45's and BB46's aft tower structures were fabricated and installed at Pearl Harbor NSY. In 1945 BB46 received a limited modernization. The casemate and heavy AA battery were removed from the 01/02 level and replaced with 16 5"/38 DP in 8 twin mounts on the 02 level. Mk37/Mk12 DP directors replacing the Mk19's abaft the bridge and a Mk34/Mk8 director was added atop the aft tower. BB46 was placed in reserve in 1947 and sold for scrapping in 1959.

BB47 was canceled in 1922 when 76% complete, to comply with the terms of the Washington Naval Treaty. The unfinished hulk was sunk in 1924 ordnance tests off the Virginia Capes.

BB48 was sunk during the Pearl Harbor attack by 5-7 aerial torpedoes, a midget submarine torpedo, and 6 bombs. In mid 1942 BB48 was refloated and given temporary repairs. During which both cagemasts were removed, and a polemast was fitted in place of the forward cagemast. The casemate guns and the heavy AA battery were removed. The heavy boat cranes and the catapult was removed from turret 3. The ship was never operational in this condition, and retained it only to transit under the ship's power in the autumn of 1943 to Puget Sound NSY for an almost identical modification as was applied to the BB43 class. BB48 rejoined the fleet in Oct 1944. BB48 was placed in reserve in 1947 and stricken for scrapping in 1959.

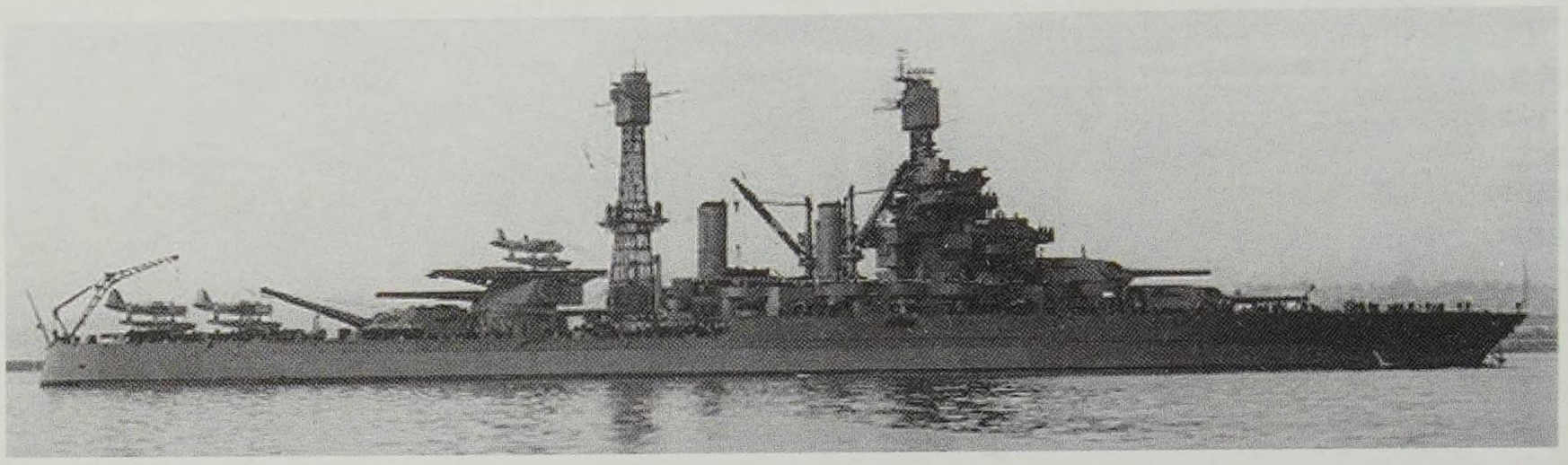
Colorado Class Battleship Statistics

Displacement:	Std 1942/BB48	32,693 tons/ 40,950tons
	FL 1942/BB48	34,946 tons 43,540tons
Dimensions:	Length WL/OA	600' 0"/624' 0"
	Beam	BB45/BB46 106" 0"
		BB48-114'0" (as mod)
	Draught	28' 4"
	Machinery	Turbo Electric/ 4 motors
	Boilers	8 oil fired
	Max Designed Speed	20.75 knts
	Weight of Eng Plnt	2,064 tons
	Fuel bunkerage/ Range	1,905 tons/5,130 nm @12 kns
	Tactical Diameter	705 yds @ 20.7 kns
		BB48 610 yds @ 20kns (as mod)
	GM	4.01 BB48 11.45
Armament:	Weight of Broadside	17,920lbs/8.65tons
	Projectile Weight	2,240lbs/1.12tons
	Max range	35,000yds/19.89miles
	Rnds /Weight per Min	2.0/17.3 tons
	Rnds per gun/ Total Rnds	100/800
	Main	8-16"/45
	Sec	12-5"/51
		BB48 16-5"/38 DP (as mod)
	AA	8-5"/25
	Lt. AA	32-40mm 33 20mm,
		BB48 40-40mm 40 20mm (as mod)
Protection:	Main (wl) Belt/ Incline	13.5-8.0" vertical /0 degrees
	Deck BB45-46/48	4.5"/3 decks/5.5"/3decks
	Turret	18"face 5"side 10" top 9" back
	Total Armor Weight	8,610 tons
		BB48 9,972 tons (as mod)
Catapults/Aircraft	1941/45	2/1 cat 4/2 aircraft

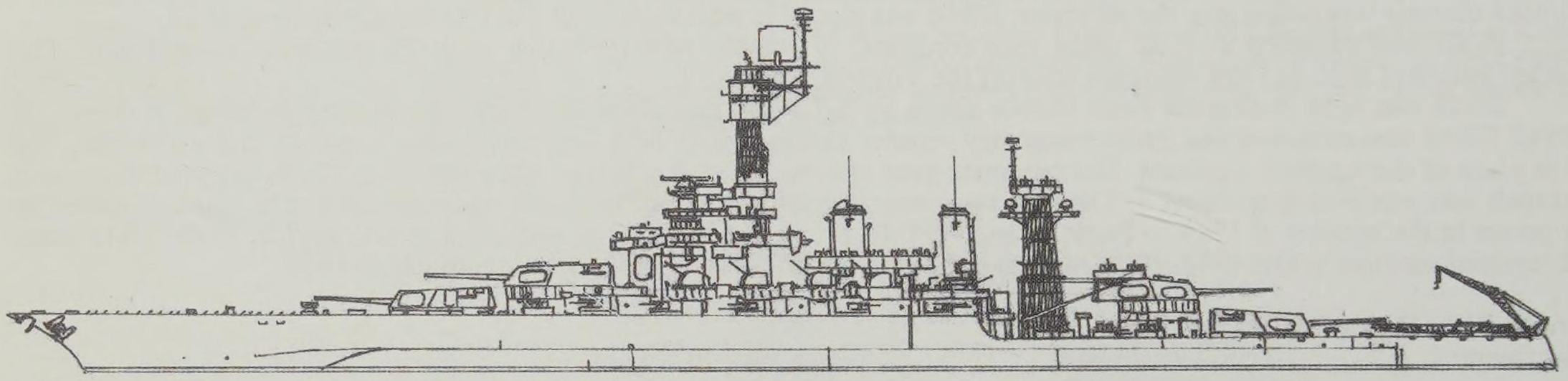
Battleship USS Colorado BB45 Call Letters: **NECR**

Builders Yard	New York Shipbuilding Co Camden NJ		
Modernizing Yard	Bremerton NSY 1941/42		
Modernizing Yard	Bremerton NSY 1944		
Reserve Group	Bremerton NSY		
Scrapping Yard	Todd Shipyard Co. Seattle WA		
Ordered	Keel Laid	Launched	1st Comm
17 Jan 1917	29 May 1919	22 Mar 1921	30 Aug 1923
Decom	Stricken	Sold	Scrap
7 Jan 1947	1 Mar 1959	15 Jun 1959	Mar 1960

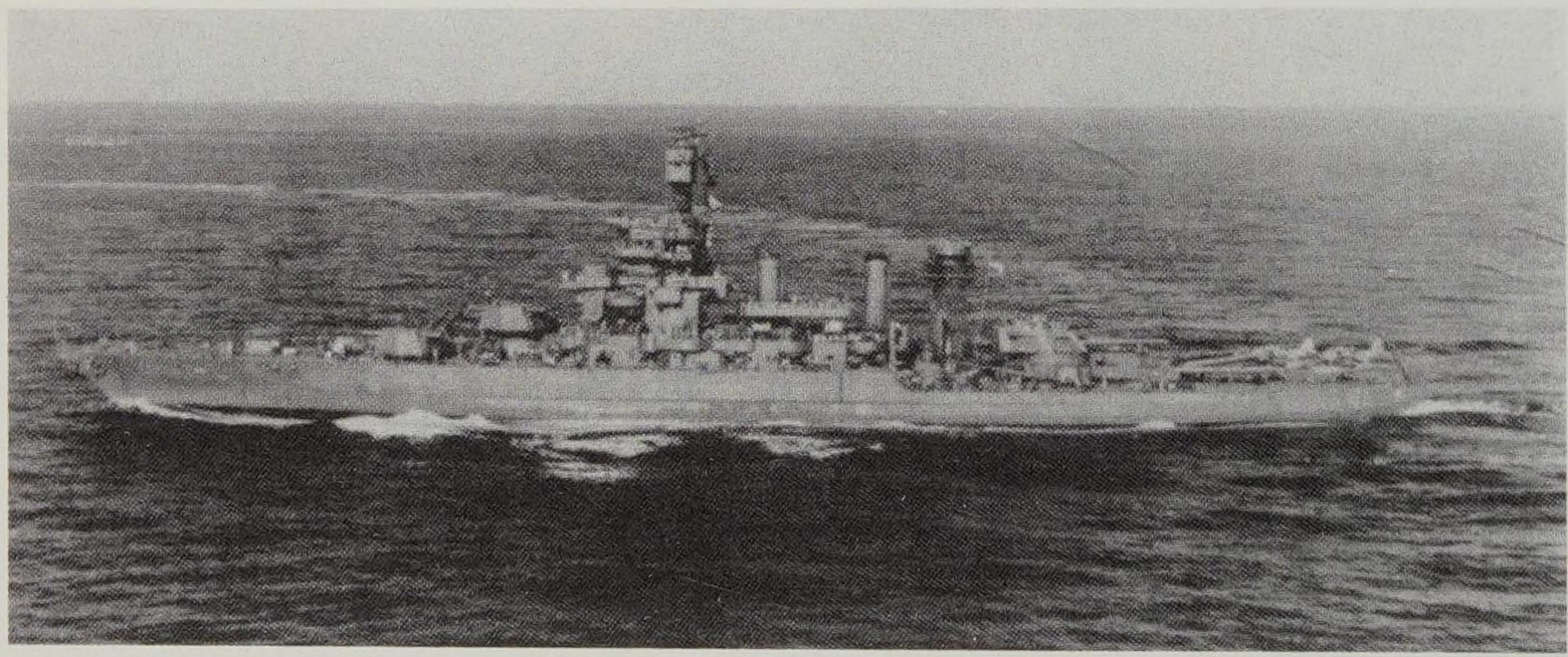
Active Service Years: 23.4



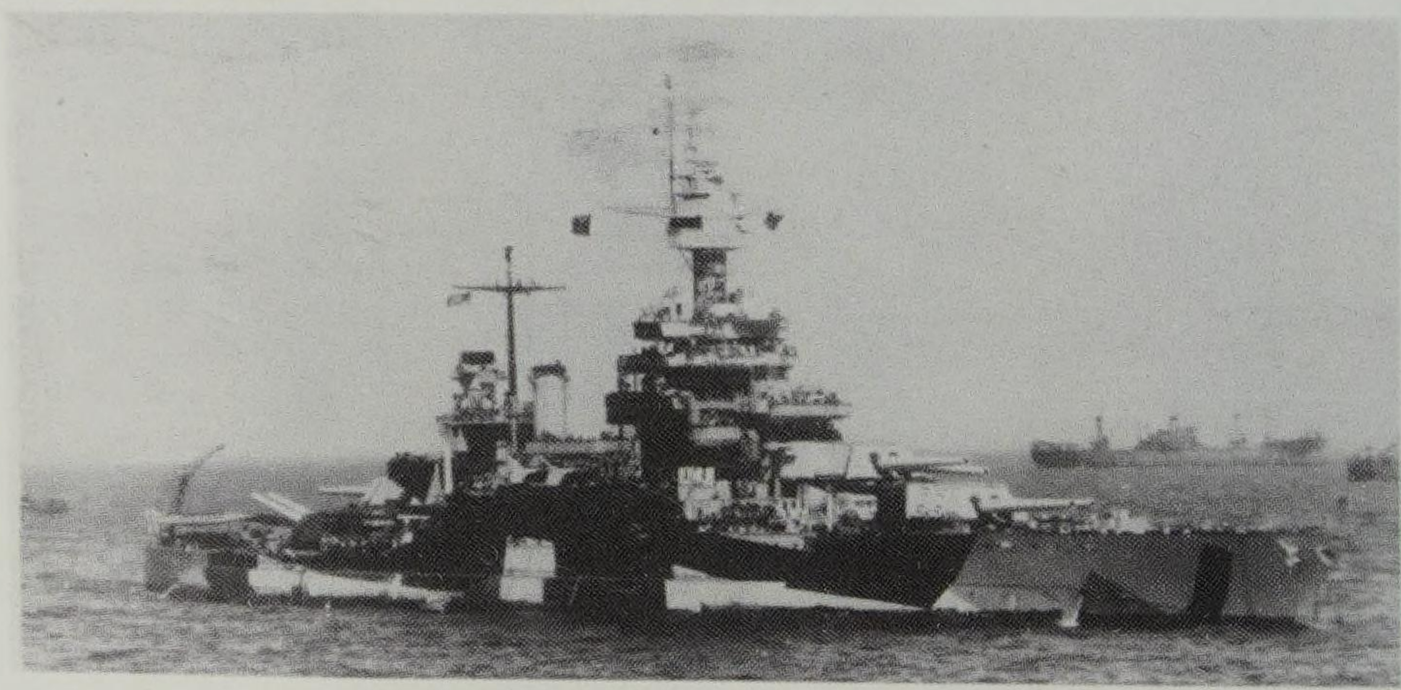
9 Feb 1942 Puget Sound NSY BB45 post 1941 overhaul. Note the ship retains prewar configuration, and does not yet have 'Pacific Fleet Shields' added to the 5"25 AA battery. Portholes have been sealed, and an CXAM1 radar is shipped atop the foremast, and a Mk3 set is mounted atop the foretop. The ship is painted Ms11 overall Sea Blue.



USS Colorado BB45 Jan 1944 Ms32/3d

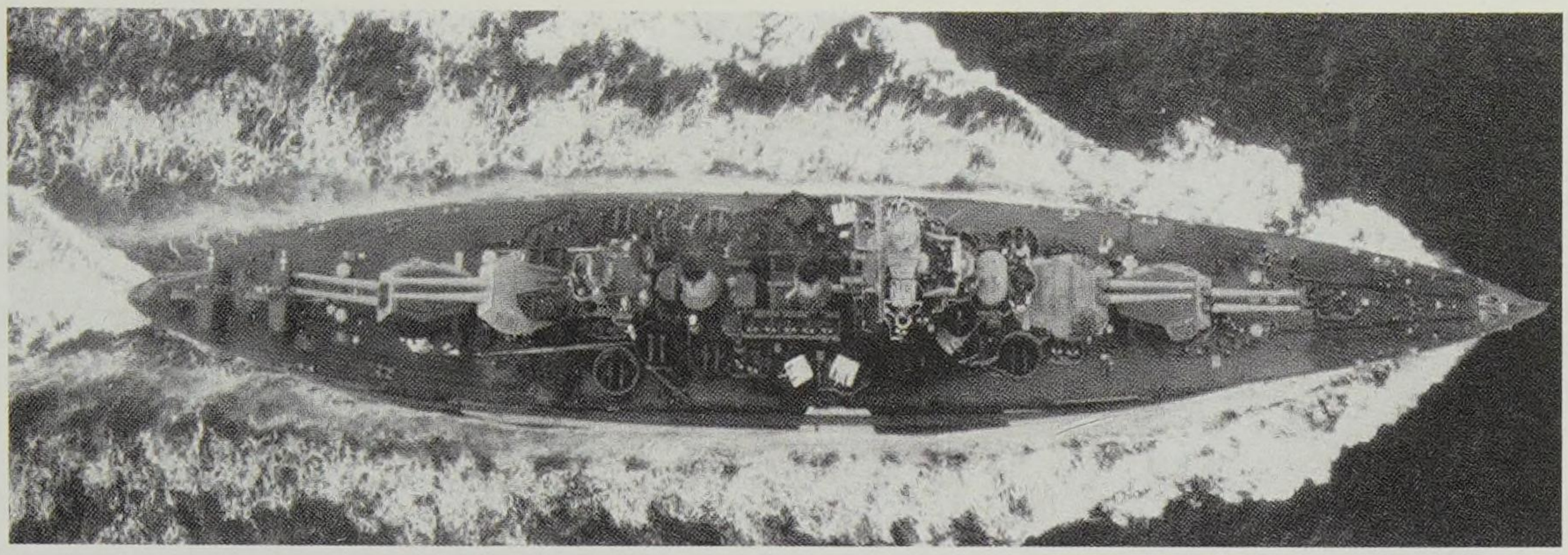


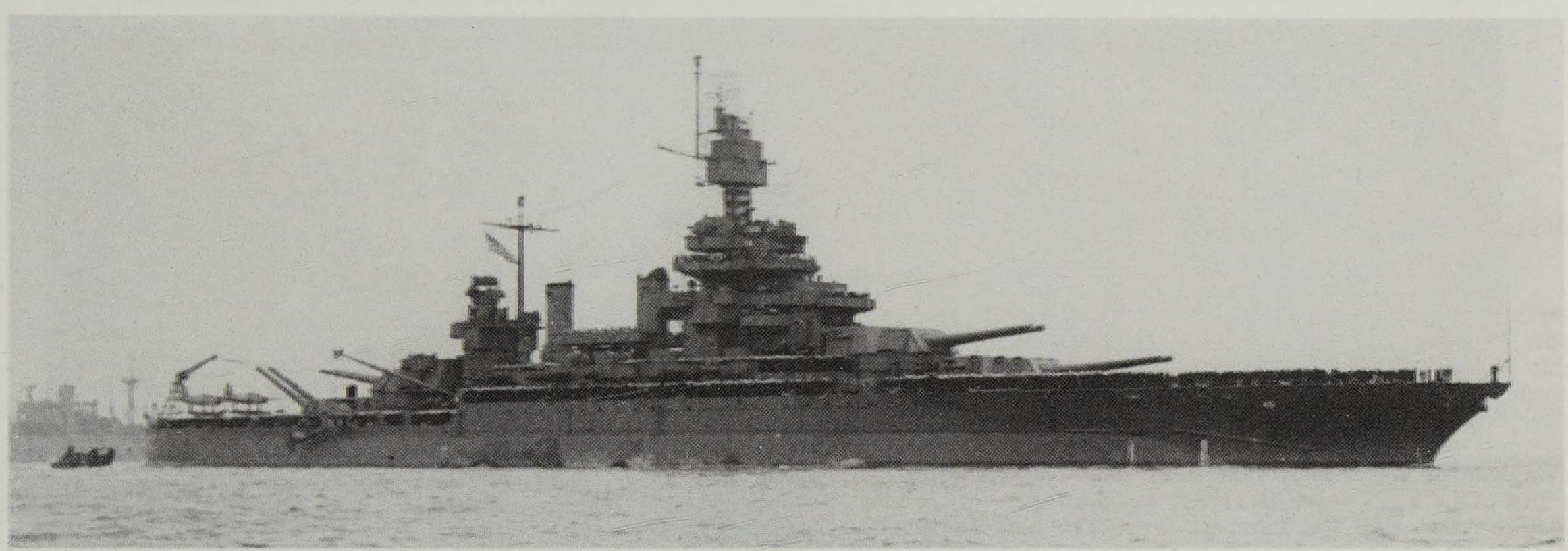
Left: Nov 1943 New Hebrides Islands. BB45 after the cagemast was cut down and topped with a gun tub for 20mm's in Jul 1942. Note the 5"/25 gun shields, and the 20mm "flying gallery" abaft the forward stack. With the exception of having the stump of the after cagemast replaced in early 1944. BB45 received minimal modernization during WWII. From Oct 1942-Nov 1943 BB45 was employed on patrols in the Southwestern Pacific. BB45 sustained moderate damage from 22 4.7" hits from shore batteries off Saipan 14 Jun 1944. The ship is painted a faded Ms11 overall sea blue.



27 Oct 1944. Unknown location. BB45 after Oct 1944 overhaul. Note the after fire control tower topped with Mk34/Mk8 director The aft tower replaced the stump cagemast in late 1943. Prewar Mk19 directors with Mk3mod1 radars have been retained for AA battery control. BB45 and the BB40 class were the only 2nd generation ships not upgraded to Mk37 DP directors. Paint is Ms32/3d.

Right: 3 Oct 1944. Puget Sound. Overhead of BB45 at 19 knots on post overhaul trials. Note the disposition of the AA battery. And the symmetrical hull form.





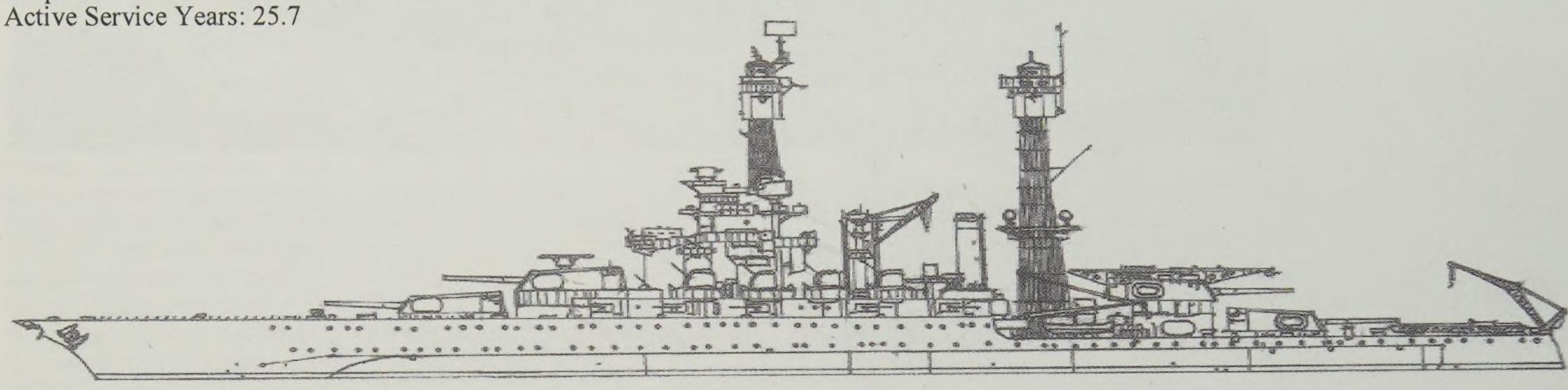
15 Oct 1945 San Francisco Bay. BB45 arriving from the Pacific Theater. The crew is "Manning the Rails" in Dress Blues, and the ship is flying a "Homeward Bound Pennant" where each foot of length of the Pennant represents one day of duty in a combat zone. Note the torpedo blister. An SK air search radar is fitted to the foremast and SG surface search sets are shipped atop the foremast and the mainmast. The Mk3 atop the foretower has been retained. Paint is Ms21. Photo by Allied Photographers.

USS Colorado BB45 Espiritu Santo New Hebrides Islands July 1943. The Colorado which missed the Pearl Harbor Attack received a limited modernization in mid 1942 As the ship never sustained major damage BB45 was the least modernized of the 2nd generation USN BB's. In the background are the Landing Ships LST's LSD's and LCI's that will make up the main body of the convoy. Overhead is a departing US Army Air Force Curtiss C46 Commando transport en route back to the Hawaiian Islands.

Battleship USS Maryland BB46 Call Letters: **NARC**

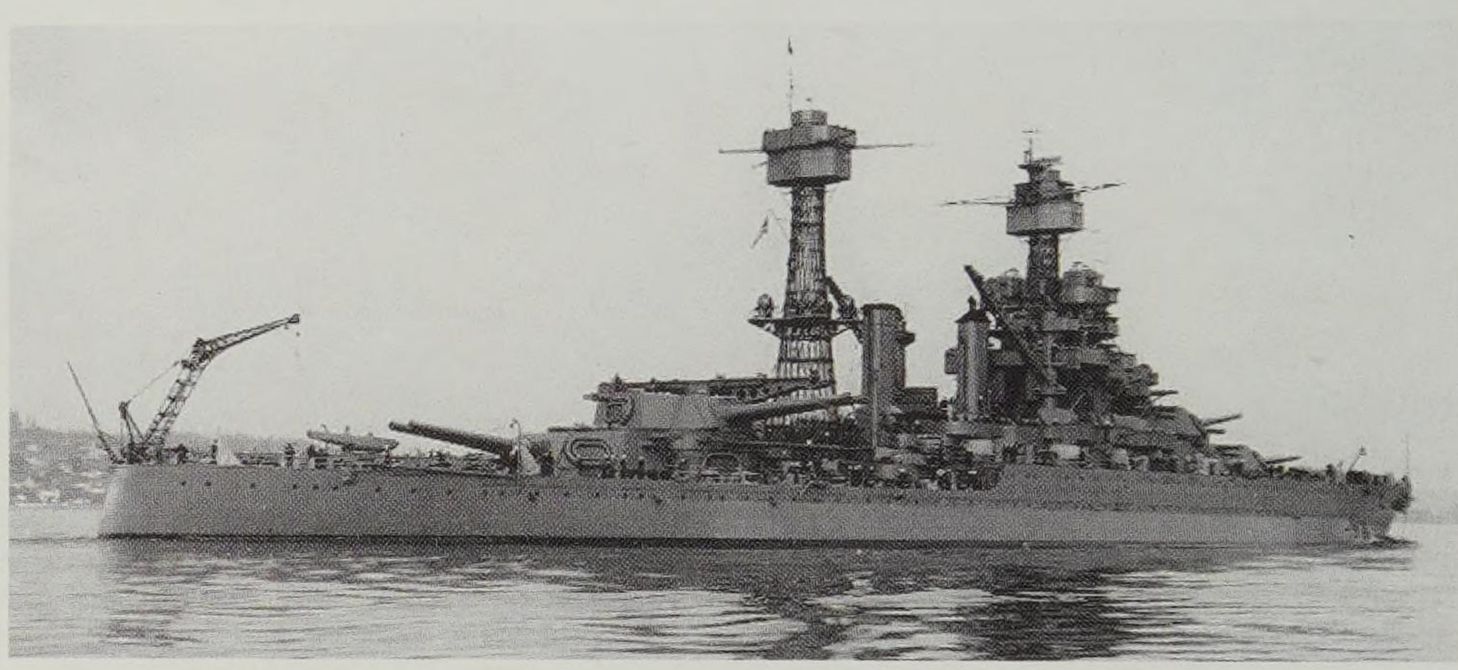
Builders Yard	Newport News Shipbuilding Co Norfolk VA		
Modernizing Yard	Bremerton NSY 1941/42		
Modernizing Yard	Bremerton NSY 1944		
Reserve Group	Bremerton NSY		
Scrapping Yard	Todd Shipyard Co Alameda CA		
Ordered	Keel Laid	Launched	1st Comm
5 Dec 1916	24 Apr 1917	20 Mar 1920	21 Jul 1921
Decom	Stricken	Sold	Scrap
3 Apr 1947	1 Mar 1959	8 Jul 1959	Aug 1959

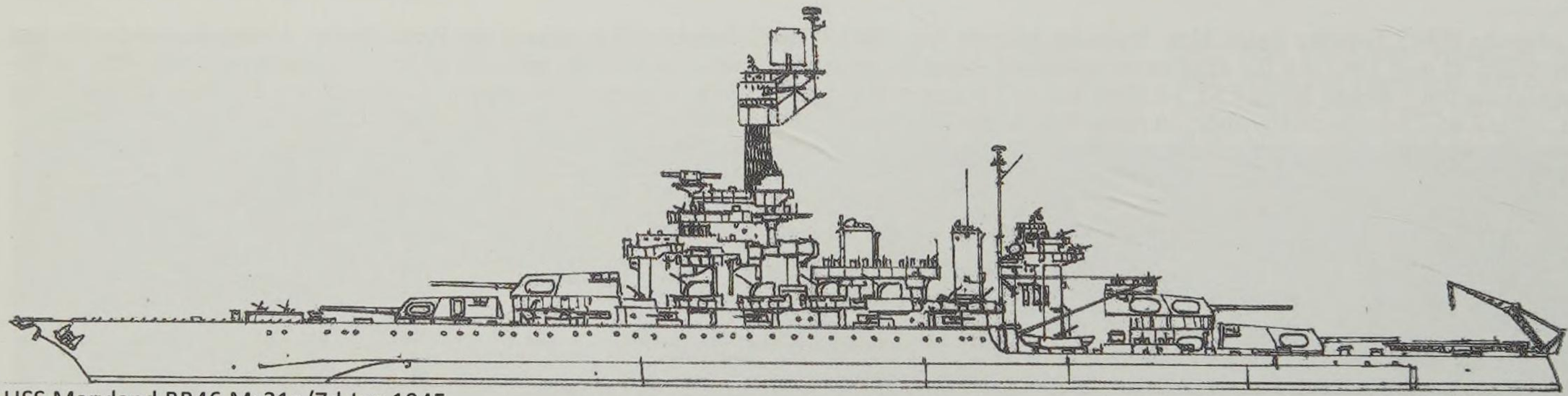
Active Service Years: 25.7



USS Maryland BB46 Mar 1942 Ms11

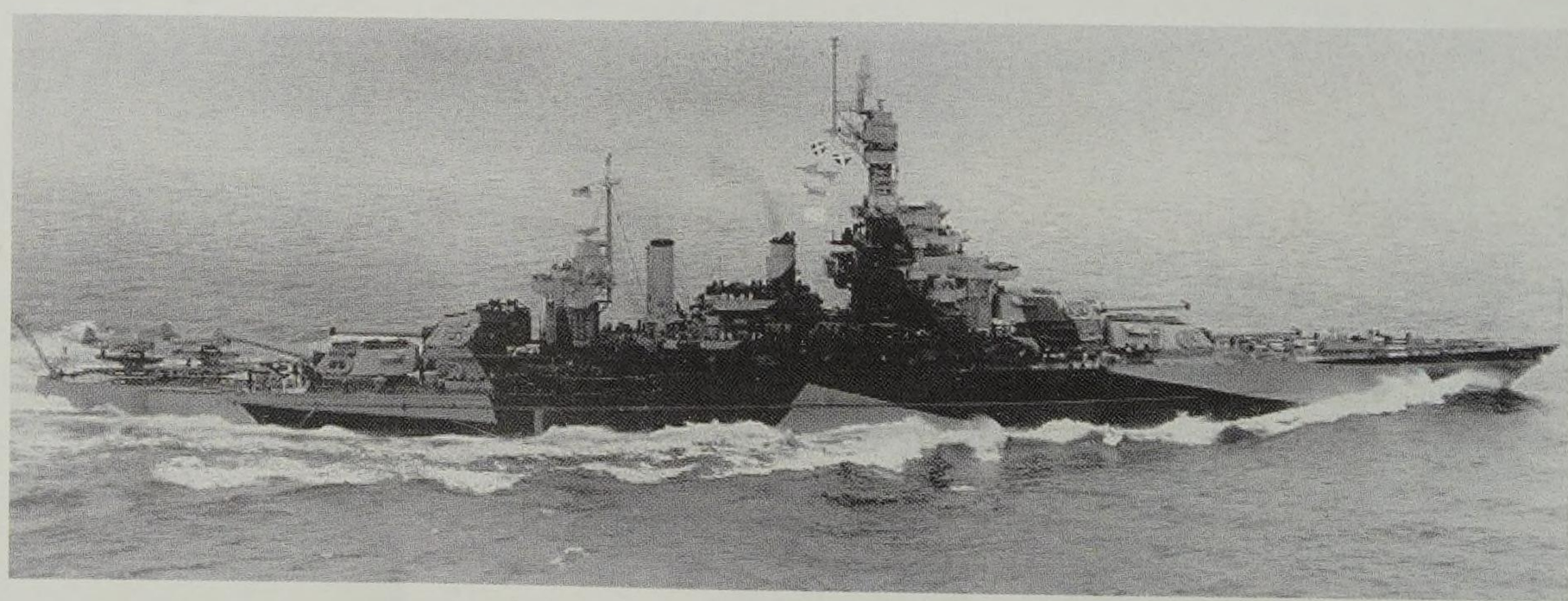
Right: 9 Feb 1942 Puget Sound NSY. BB46 post Pearl Harbor configuration. Note the ship still retains hull portholes. Most hull portholes were sealed up on USN BB's in their first wartime refits to improve water tightness. BB46 is still in prewar rig with the exception of the shields that have been added to the 5"/25 heavy AA battery and the CXAM1 radar atop the foremast the Mk3 added to the foretop and the stack cap fitted to the forward stack. BB46 also retains an optical rangefinder atop turret 2. Paint is Ms11 overall Sea Blue with no hull numbers.



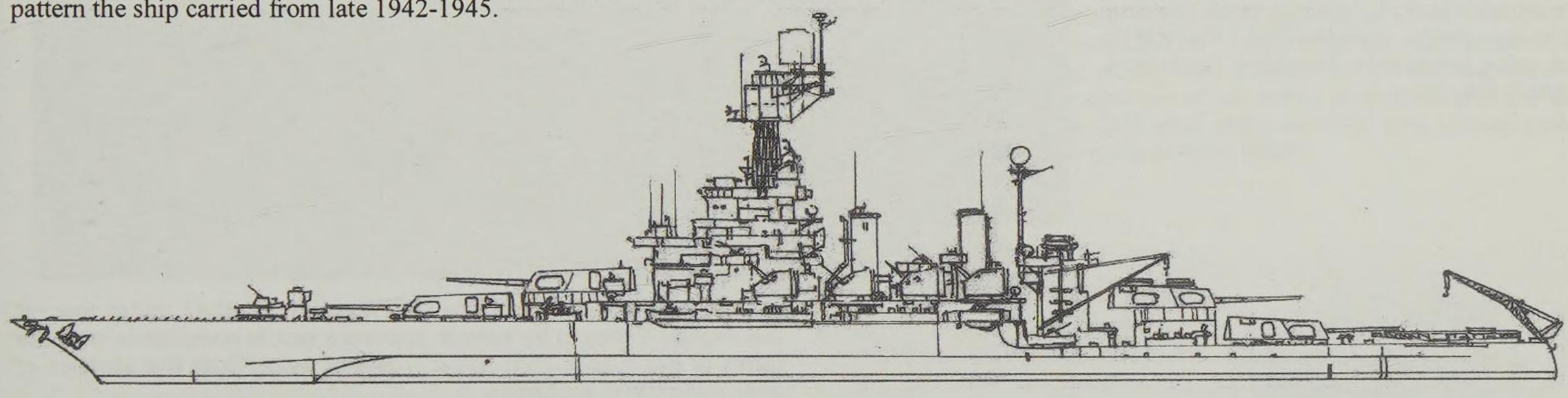


USS Maryland BB46 Ms31a/7d Jan 1945

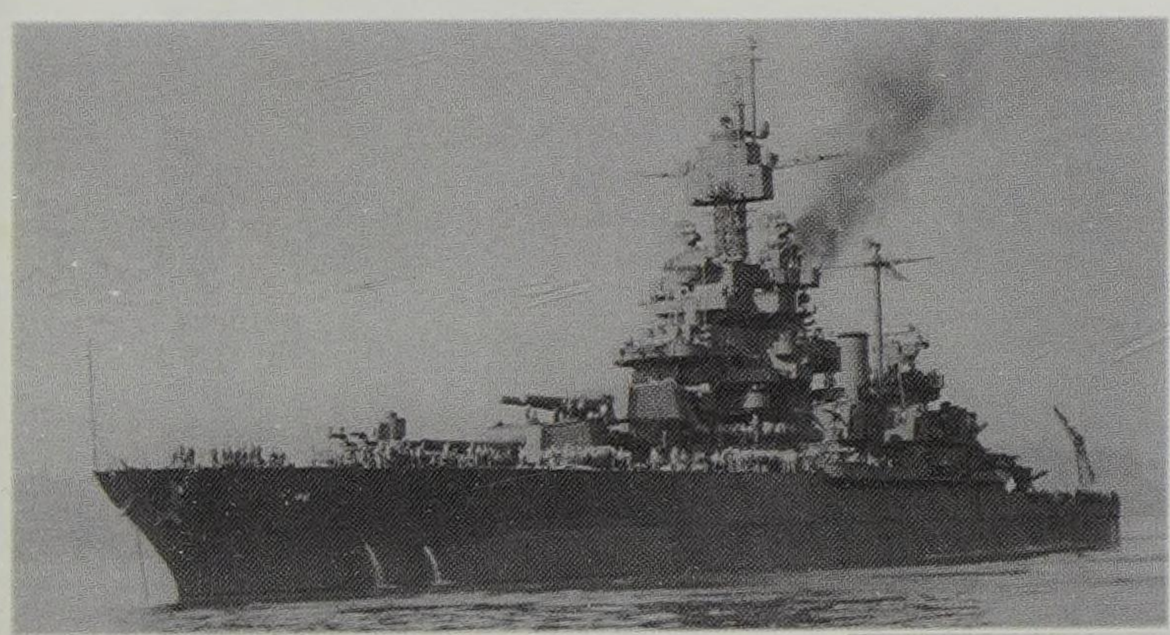
Right: 26 Apr 1944 Puget Sound. BB46 running post overhaul speed trials. Note the flying platform for 20mm's, the 5"/25 AA battery with shields, SK radar forward Mk3 FC radar atop the foretop and the aft tower. Paint is Ms31a/7d.



USS Maryland BB46 Puget Sound Naval Ship Yard May 1945. Arriving at Puget Sound for repairs and refit in mid 1945, after having fought across the Pacific. BB46 has returned for repair of aerial torpedo damage to the ship's bow sustained off Saipan on 22 Jun 1944. Maryland has fought her last battle as the war ended before the ship could return to the Pacific Theater. The Maryland is painted the Ms31a/7d camouflage pattern the ship carried from late 1942-1945.

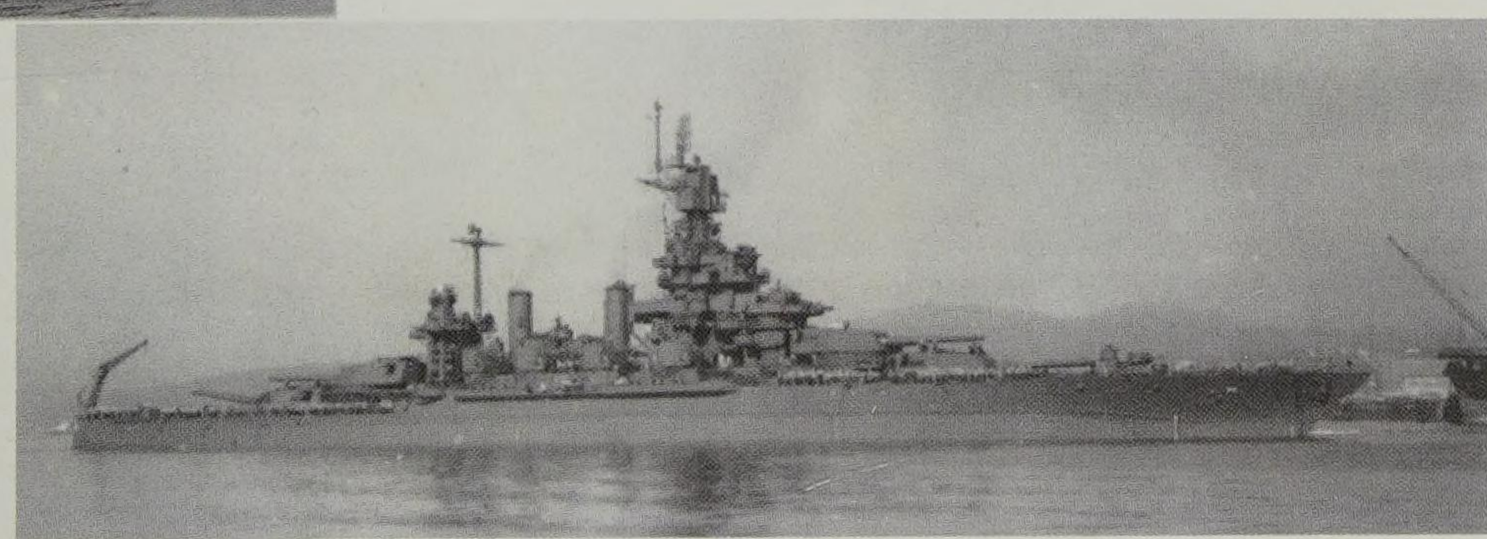


USS Maryland BB46 Oct 1945 Ms21



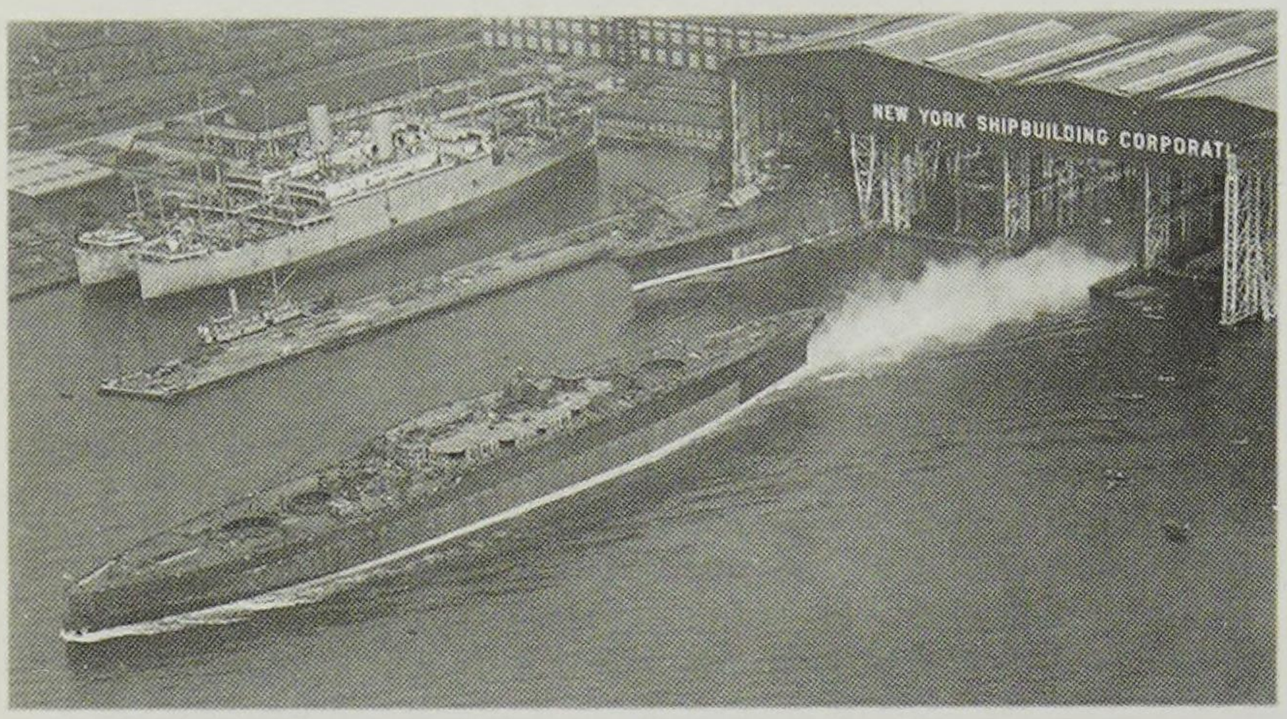
21 Aug 1845 Puget Sound NSY. BB46 final appearance with 8 twin 5"/38 DP mounts and Mk37/Mk12/22 DP Directors. Note the Mk34 Main Battery director atop the after FC tower. An SP2 set is fitted atop the mainmast with an SK set forward. The ship is painted Ms21 with unpainted natural teak decks. dbc

21 Aug 1845 Puget Sound NSY. BB46 never returned to operational combat status after completing post overhaul trails and shakedown as the war had ended. BB46 did make 5 'Magic Carpet' roundtrip voyages to Asia returning over 8,000 servicemen to the US.



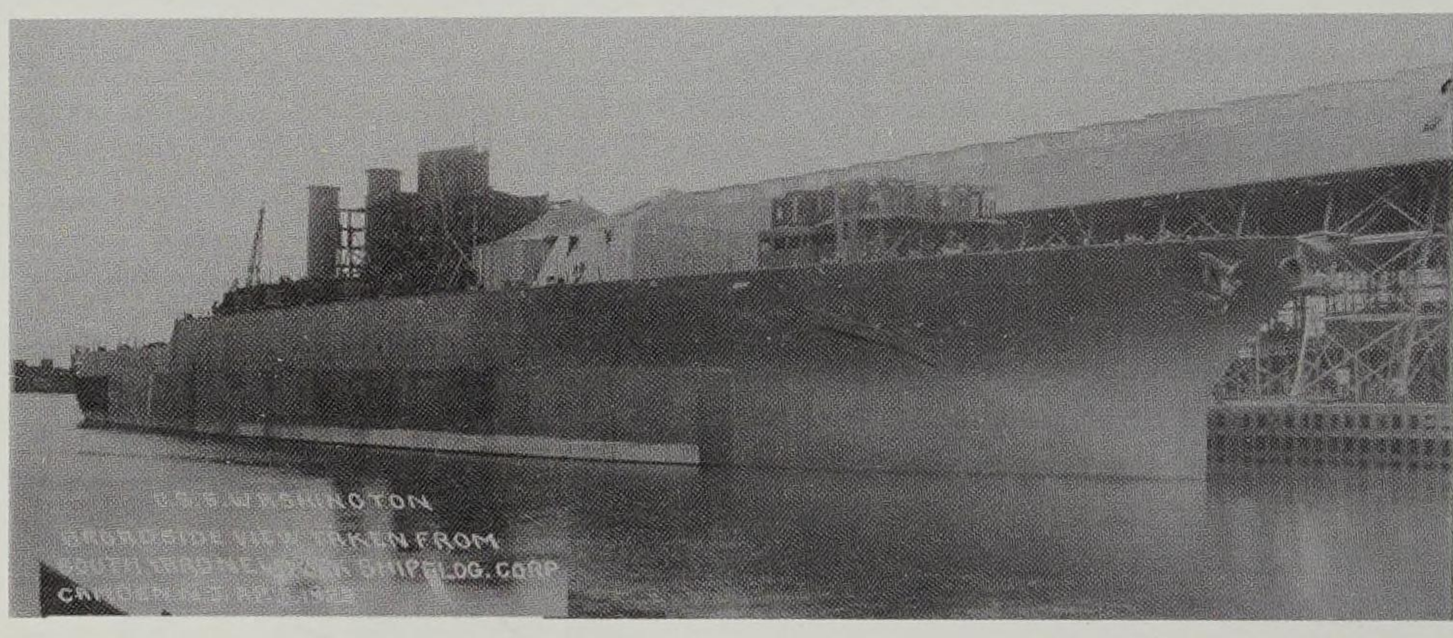
Battleship USS Washington BB47 (canceled) Call Letters

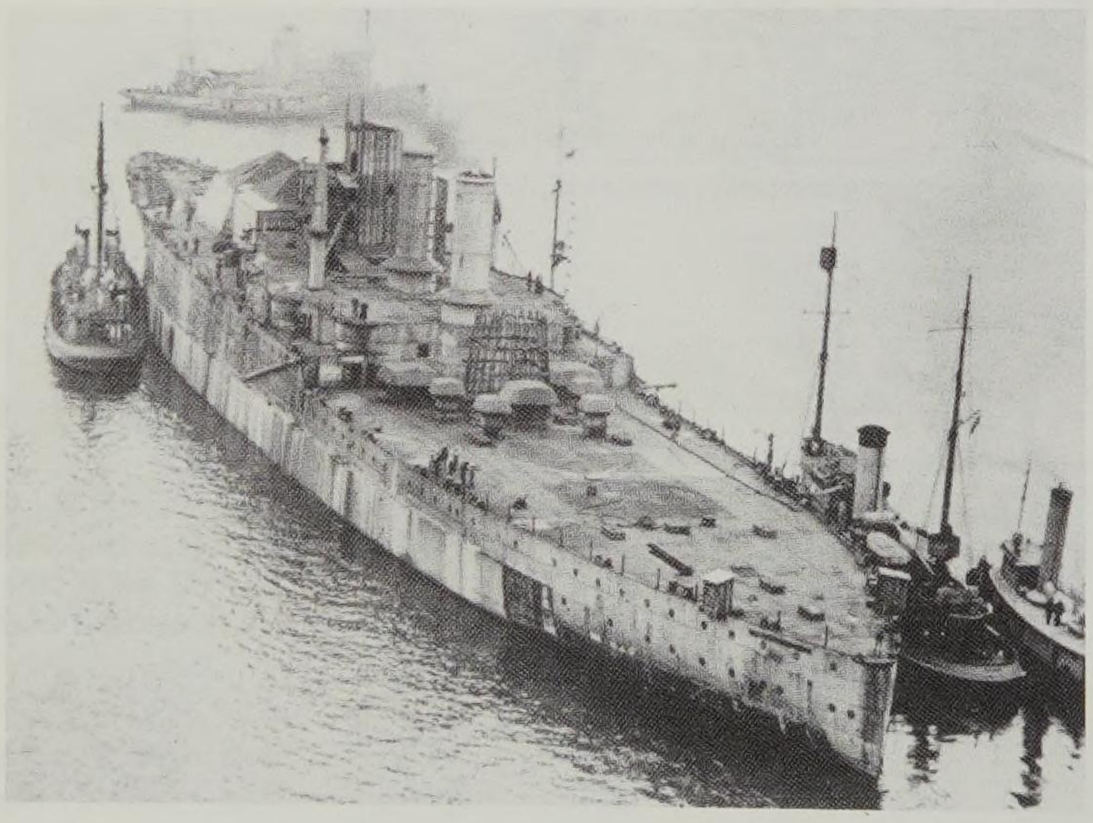
Builders Yard		New York Shipbuilding Co Camden NJ	
Ordered	Keel Laid	Launched	1st Comm
5 Dec 1916	30 Jun 1919	1 Sep 1921	
Stricken	Sold	Sunk	
		25 Nov 1924	



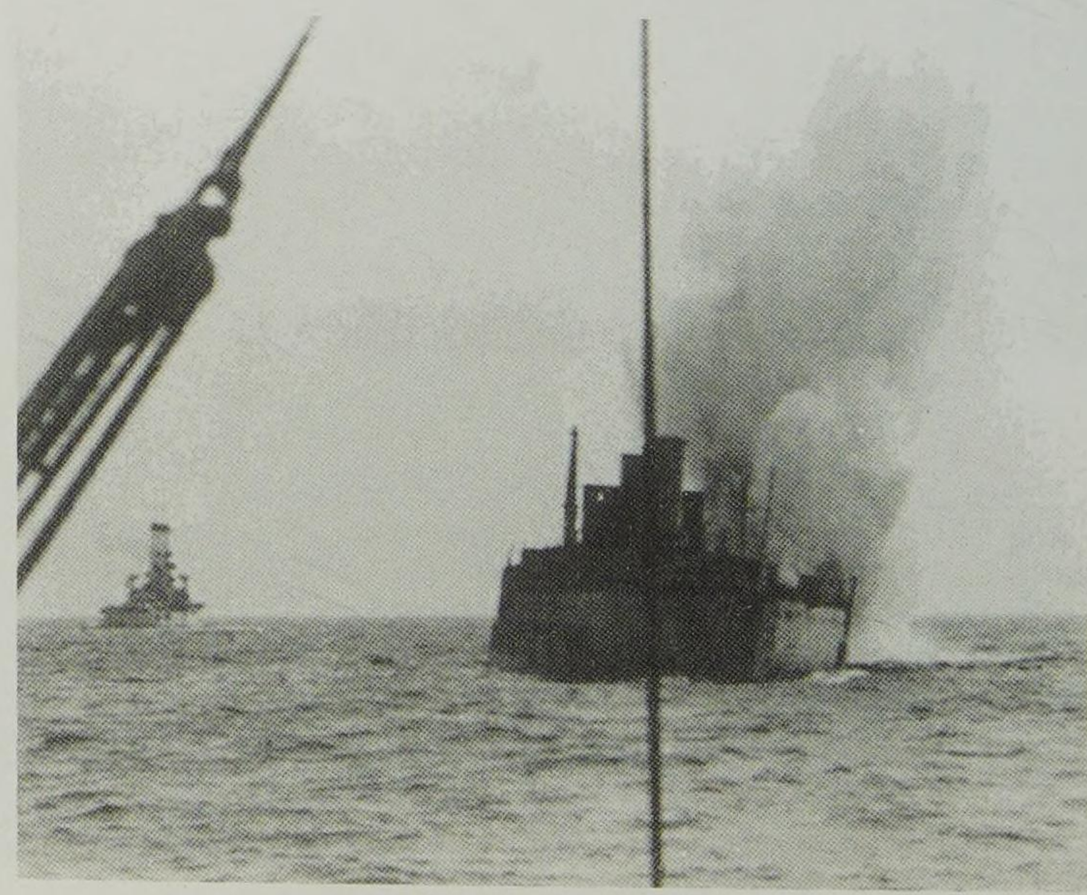
1 Sep 1921 NY SBCo. Camden NJ. BB47 launching. Note the construction ways are covered making working on the ships easier in inclement weather. Note the forward section of the already launched USS Colorado BB45 to the left in the also covered fitting out basin.

5 Apr 1925 NY SBCo. Camden NJ BB47 Approximately 80% complete. Note the armor belt. The forward turret locations are covered with tents to protect workmen and machinery during construction. The ship's paint color appears to be either black or a very dark gray color.





Left: 22 Nov 1922 Hulk of the USS Washington BB47 under tow off the Virginia Capes to be sunk in ordnance test in compliance with the terms of the Washington Naval Treaty of 1922. Note the absence of after main turret barbettes.

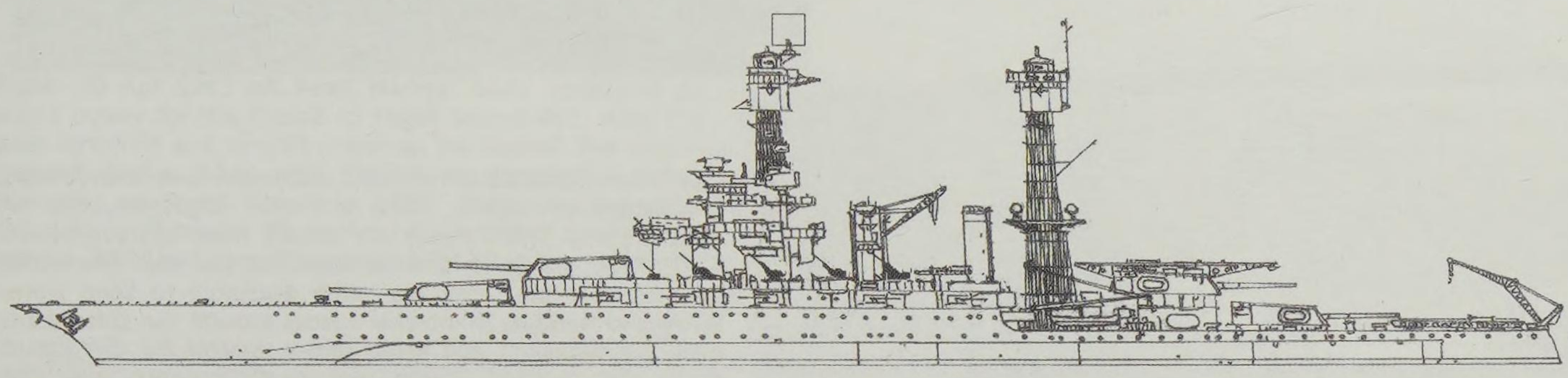


Right: 26 Nov 1924 BB47 is struck by a 14" salvo from the USS New York. While never completed BB47 nevertheless performed an important function for the USN by providing useful, and otherwise, unattainable, data on the effects of modern ordnance on a modern armor/protection system. The data obtained was used in the development of the USN 3rd generation protection systems. The also cancel Japanese BB Tosa was use in similar testing and the data obtained used to develop the protective systems of the Yamato class BB's

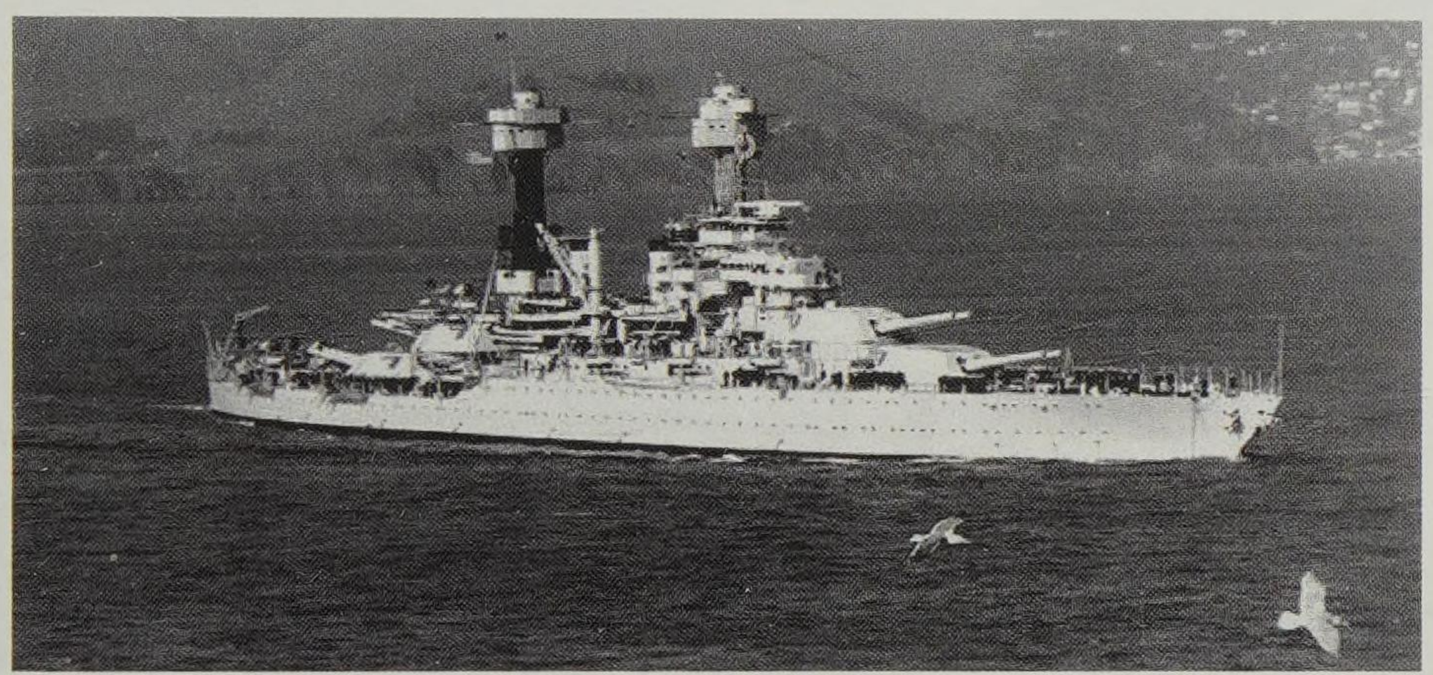
Battleship USS West Virginia BB48 Call Letters: **NEDJ**

Builders Yard	Newport News Shipbuilding Co Norfolk VA		
Modernizing Yard	Bremerton NSY 1944		
Reserve Group	Bremerton NSY		
Scrapping Yard	Union Minerals Oakland CA		
Ordered	Keel Laid	Launched	1st Comm
5 Dec 1916	12 Apr 1920	19 Nov 1921	1 Dec 1923
Decom	Stricken	Sold	Scrap
9 Jan 1947	1 Mar 1959	17 Aug 1959	Jan 1961

Active Service Years: 22.7



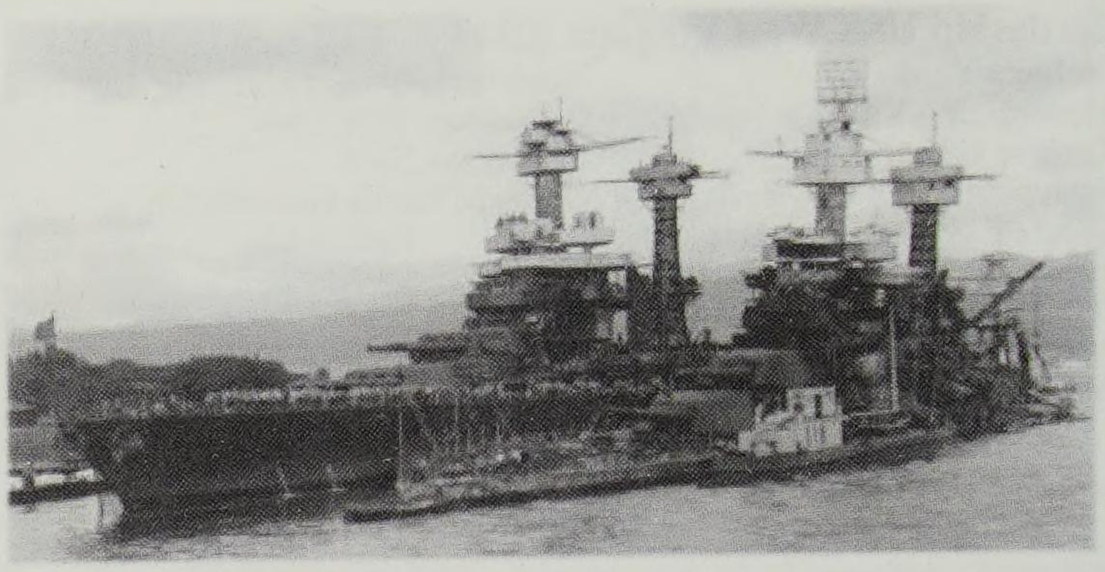
USS West Virginia BB48 Nov 1941 Ms1

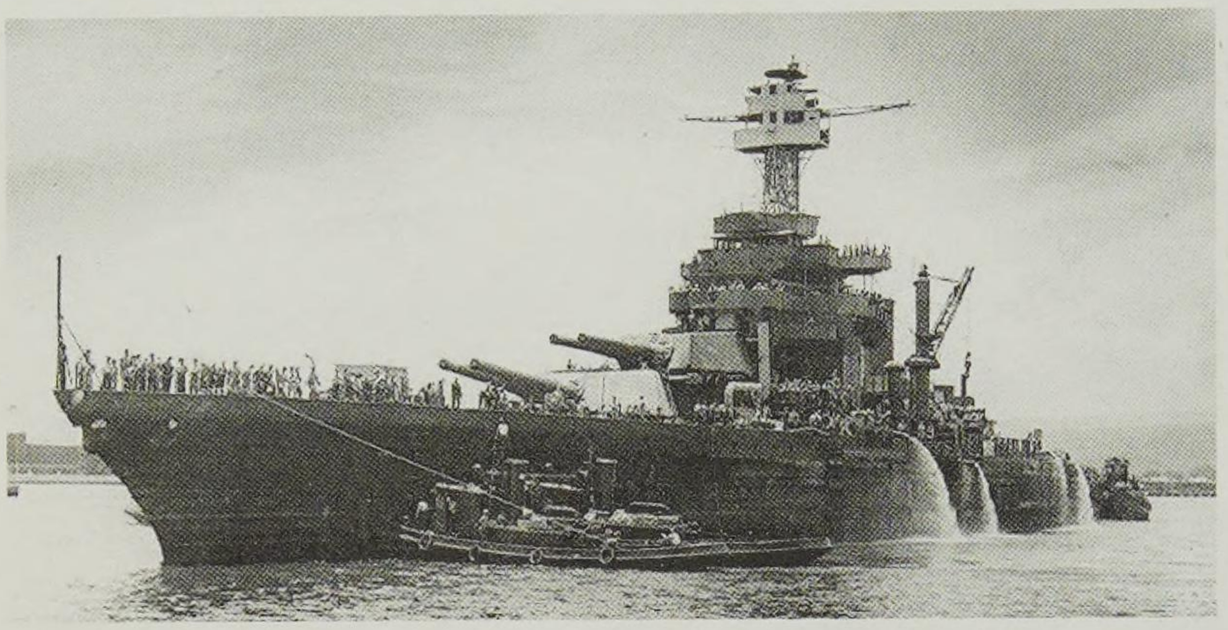


Circa 1936 USS West Virginia BB48 in San Francisco Bay. Final prewar appearance after mid 1930's overhaul. Note the lack of guntubs on the 5"/25 AA battery which were added in 1941. Paint is the "Prewar White" Ms3. With the exception of MG tubs added fore and aft on the fighting tops and the addition of aircraft handling facilities the BB43 and BB45 class ships received only normal upkeep overhauls prior to WWII.

Circa 1939 USS West Virginia leads the Battleline into San Francisco Bay. The image of the Line Ahead Battlefleet embodied the vision of Naval Power of the US Navy and the resolve of the United States in the interwar years. Collection Sterling Supply Co Huntington WV.

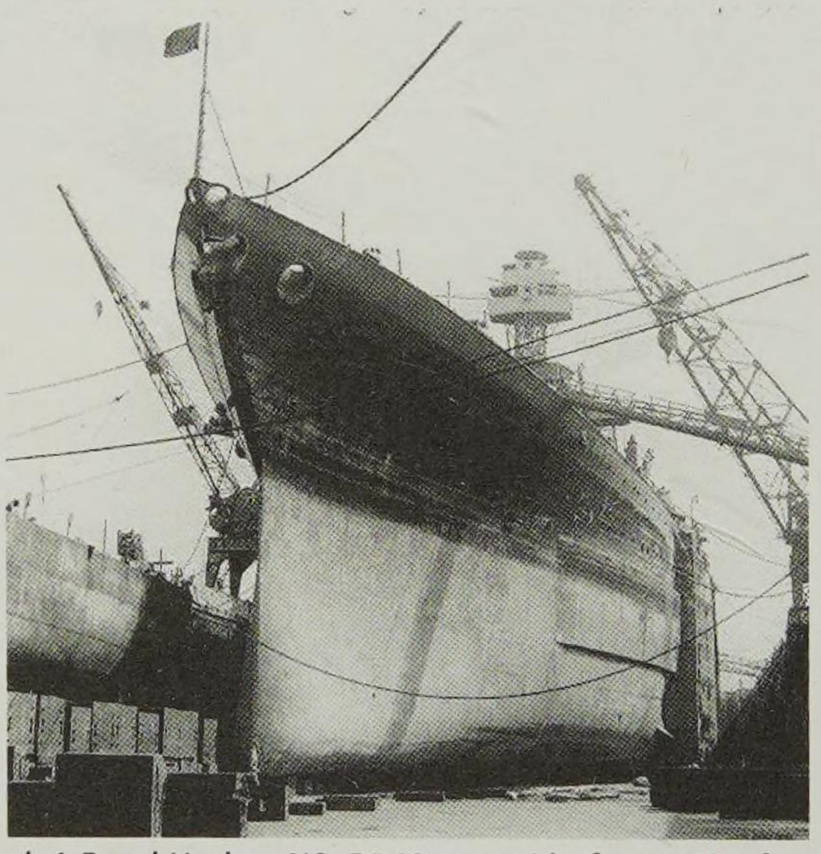
Right: 10 Dec 1941 USS Tennessee BB43 (L) was wedged against the mooring quays by the sunken BB48. It was necessary to dynamite the quays in order to free BB43. BB48 remained sunken for 5 months until Jun 1942. Note the CXAM radar atop the foremast of BB48. Only BB44 and BB48 were so equipped on 7 Dec 1941. But the radars were not operating on the morning of 7 Dec 1941 due to the hills around Pearl Harbor and as the defense of the Hawaiian Islands and hence the Battlefleet when in port was the responsibility of the US Army.

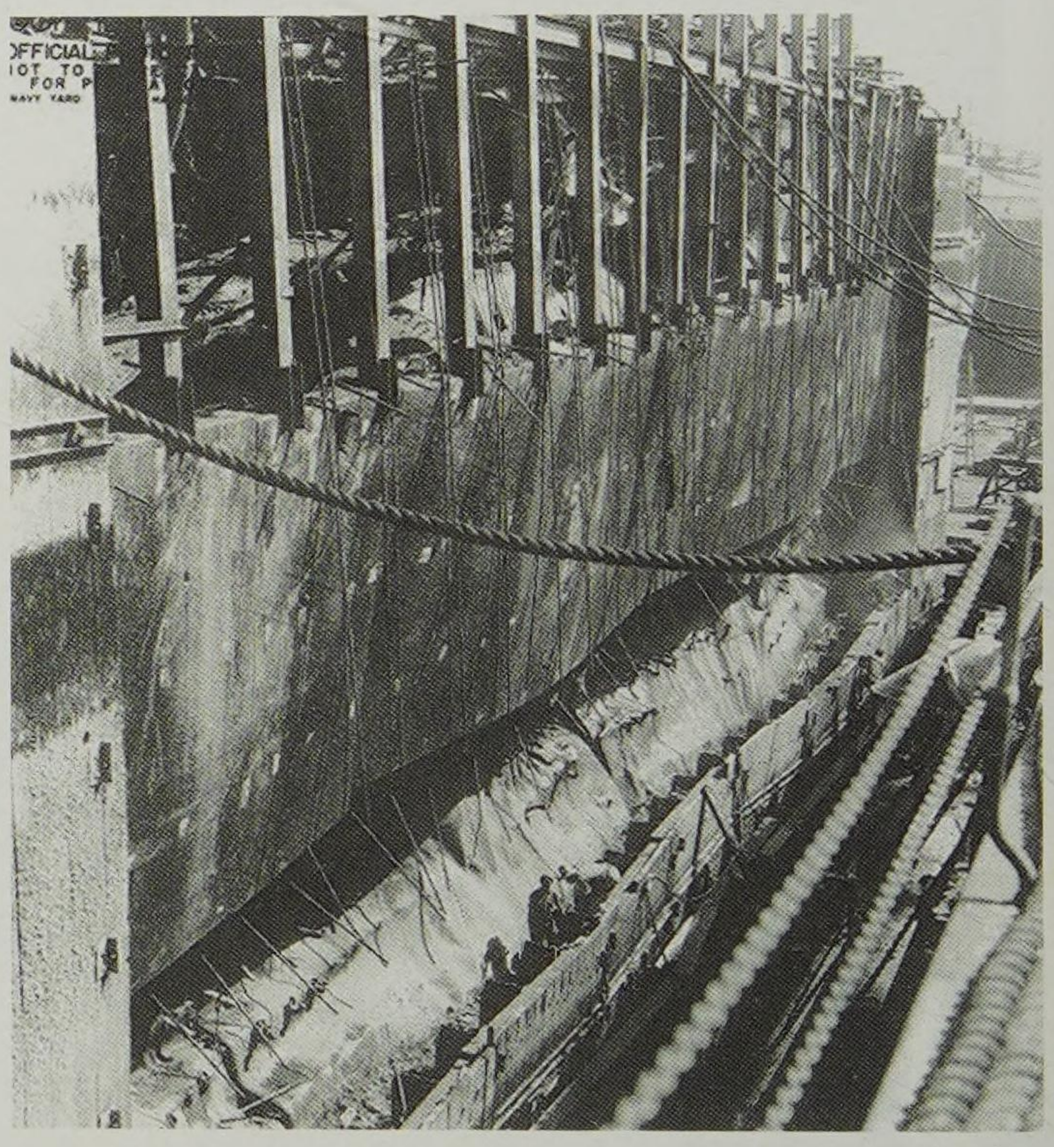




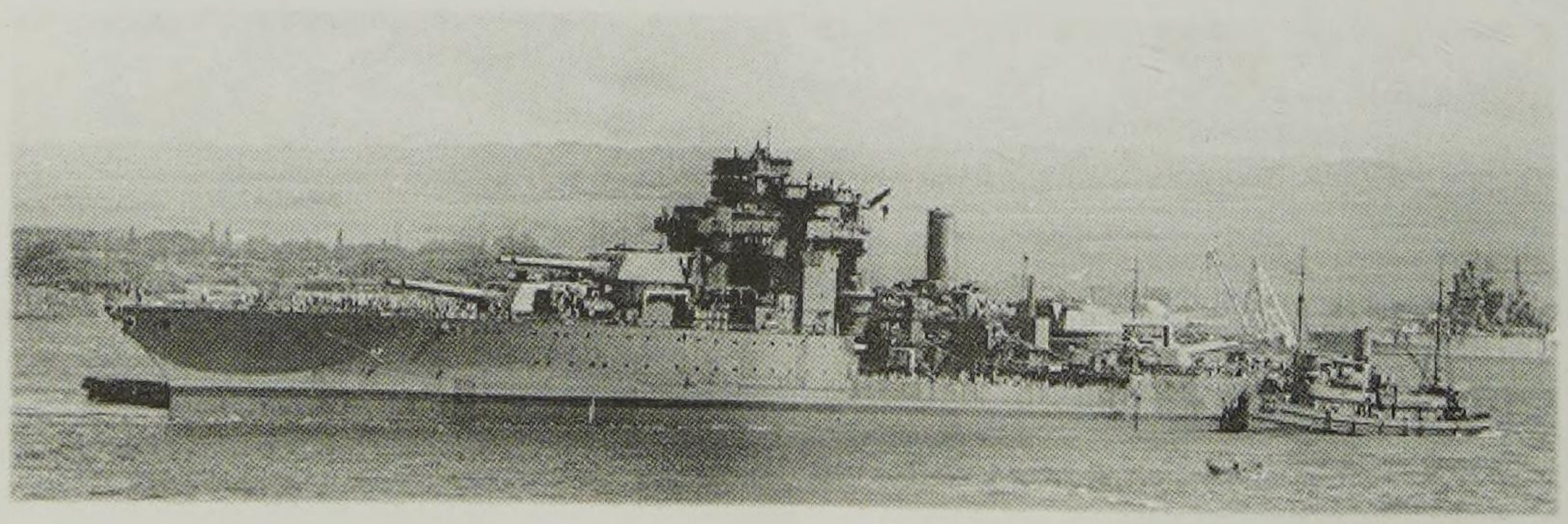
Left: 7 June 1942 BB48 refloated and under tow to Drydock 1 for temporary repairs. Note the after cagemast, the AA directors and 5"/25 Heavy AA battery have been removed. Notice also the water and oil stains on the hull. The water streams over the sides are pump discharge to keep water levels and flooding in internal spaces around the cofferdams over the damaged hull areas under control for the transit down the channel. There was much concern over the possibility of one of the salvaged BB's floundering while enroute 'down channel' to Drydock1.

Right: 8 Jun 1942 Drydock 1 Pearl Harbor. Note the cofferdam 'patch' added prior to refloating, and the armor belt. Temporary repairs would take 3 months of drydock work. The Turbo Electric components as well as the hull damage had to be repaired and reconditioned after 5 months of salt water immersion.

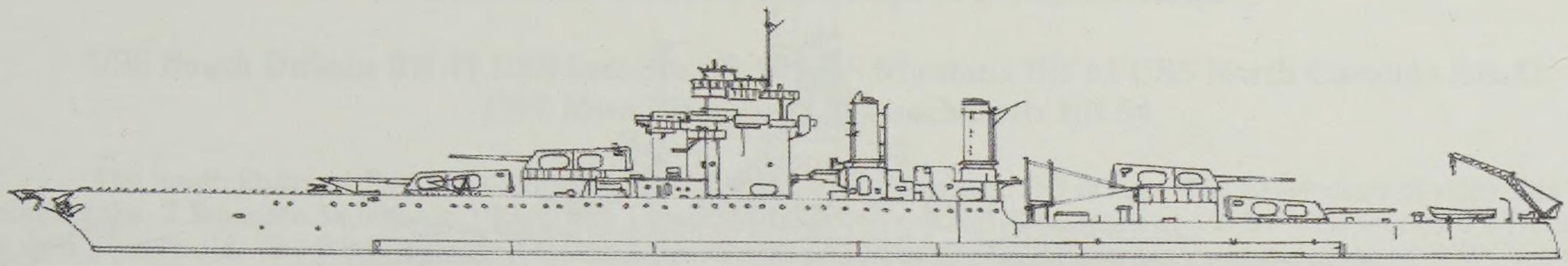




Right: 11 Jun 1942 Drydock 1 Pearl Harbor NS. BB48 port side frame 91 after removal of cofferdams. Damage is from the detonations of 5-8 torpedoes. The exact number of hits is unknown due to torpedoes entering the hull in previous torpedo damaged areas. Note the deformation of the armor belt. The Japanese set their torpedoes to run deep enough to strike below the armor belts on the USN BB's. The addition of anti torpedo blisters to 1st /2nd generation BB's were intended to help minimize this type of damage. Damage data from the USN ships sunk at Pearl Harbor was applied into rebuild and modernization programs.

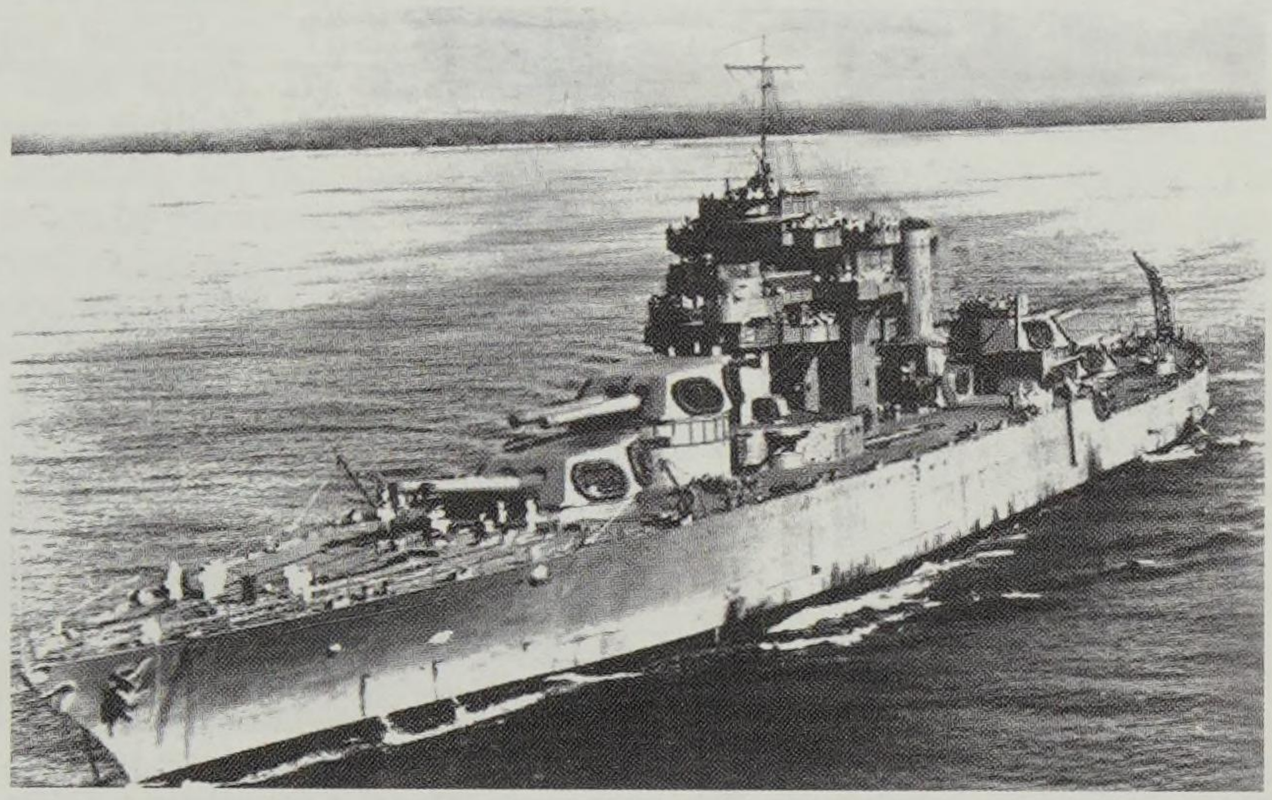


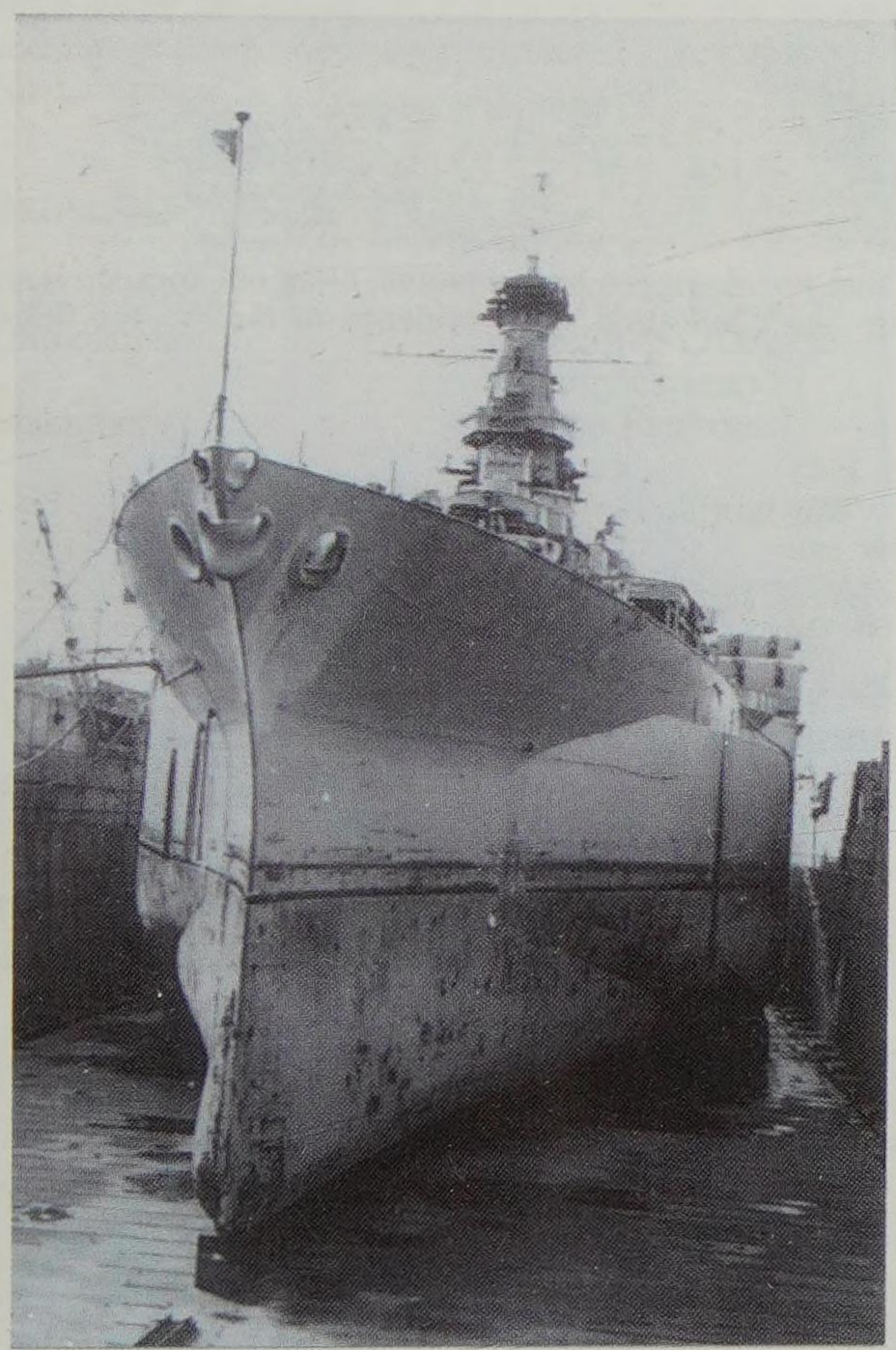
Left: Apr 1943 Pearl Harbor. BB48 under tow, post hull repairs. Paint is Ms14. BB48 is being moved pierside to complete repairs of the engines and to prepare the ship for sea. Paint is Ms14. Notice the unusual location of the hull number.



USS West Virginia BB48 Apr 1943 Ms14

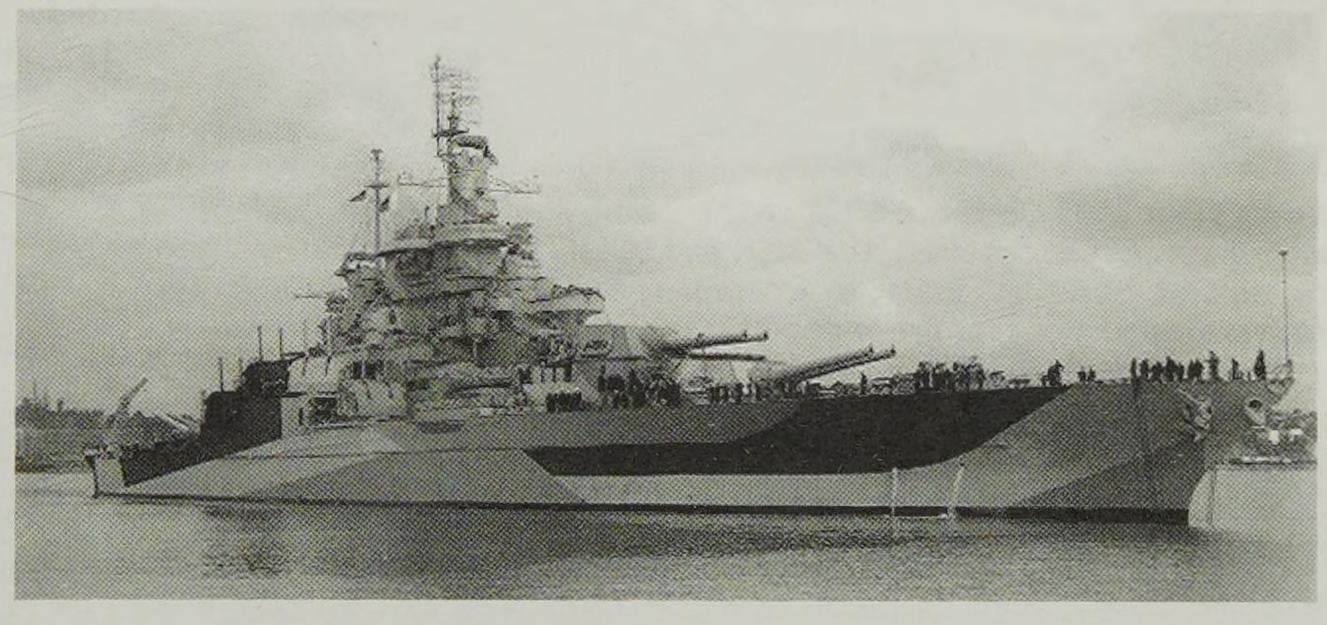
Right: 30 Apr 1943 off Pearl Harbor. BB48 underway on ship's power for the transit to Puget Sound NSY. Note the pole foremast and aircraft crane on the fantail. The ship is painted Ms14. BB44 was similar in appearance when transiting to Puget Sound in 1942. BB48 was the most extensively damaged BB to be repaired and returned to service. BB48 had been the newest USN BB at Pearl Harbor.



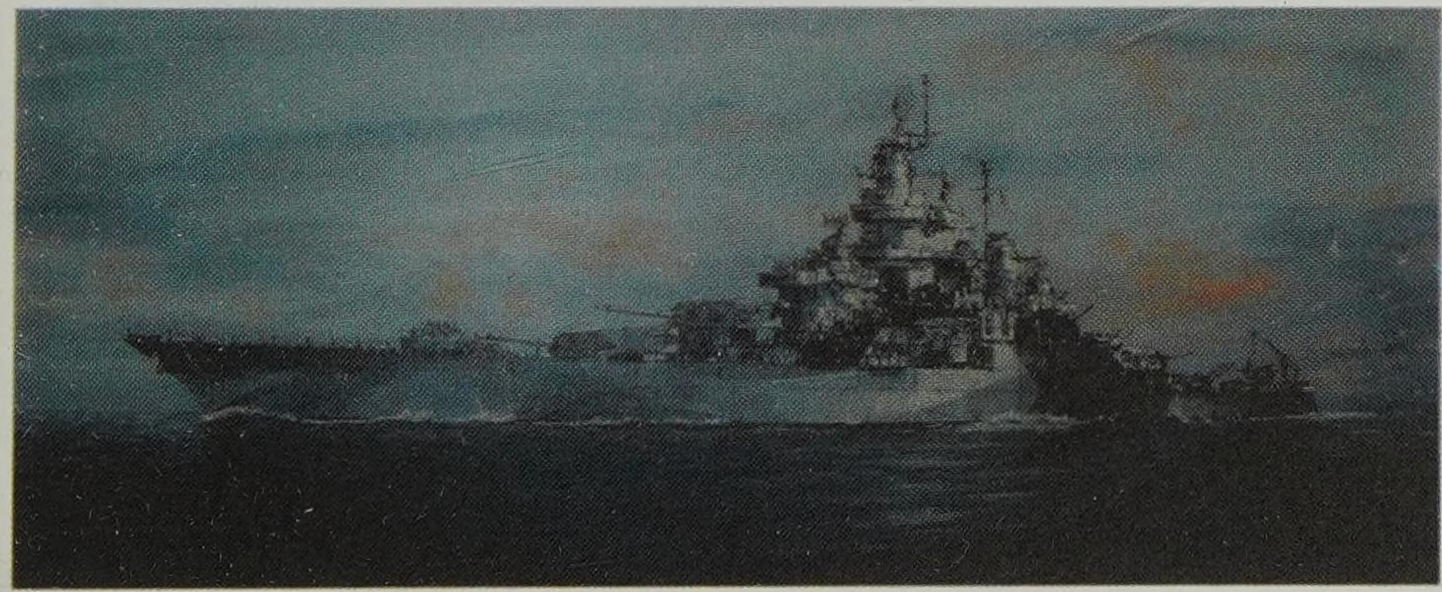


Left: circa Apr 1944 Puget Sound NSY. BB48 undergoing modernization. Note the torpedo blisters which increased the ships beam to 114'. The hull work has been completed and the Mk34 Main Battery Fire Control Director has yet to be installed. The ship started post overhaul trails in Jul 1944.

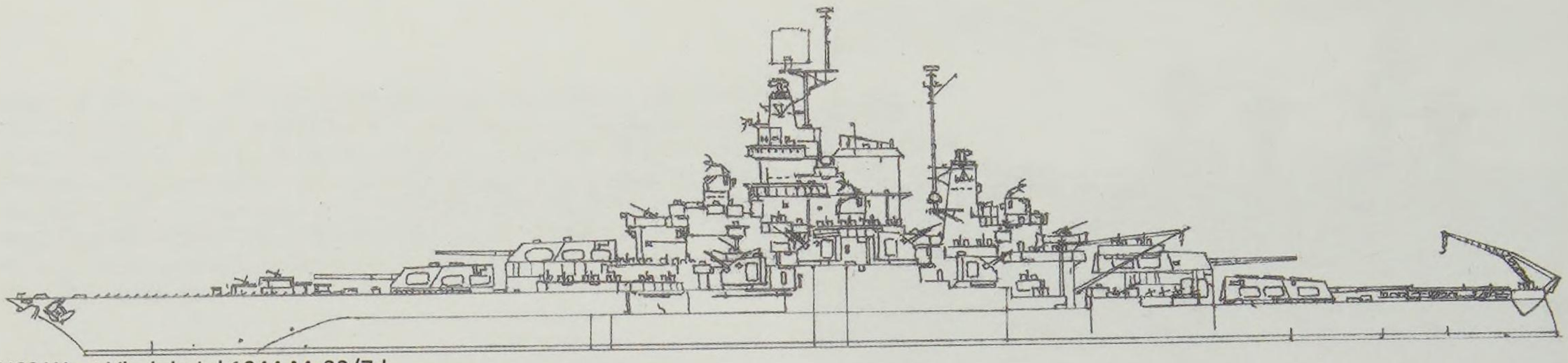
Below: 2 Jul 1944 Puget Sound NSY BB48 after modernization. BB48 reached IOC Sep 1944, and rejoined the fleet in Oct 1944 off the Philippines. Ms32/7d.



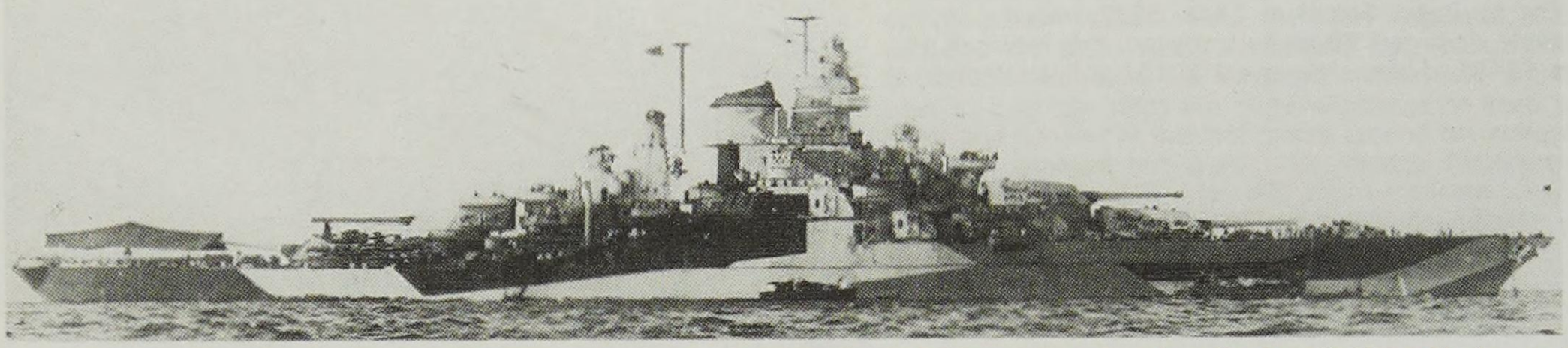
Below: Jun 1944 Puget Sound. BB48 as rebuilt on shakedown. Note the large number of 40mm and 20mm AA guns and 16" battery trained out.



Circa Jul 1945 BB48 at sea at twilight. Normal operating procedure when in a combat zone during WWII was for a USN ship to assume 'General Quarters' (battle stations) at dawn and dusk as that is when the risk of air or submarine attack was perceived to be the greatest. Collection Sterling Supply Co Huntington WV.



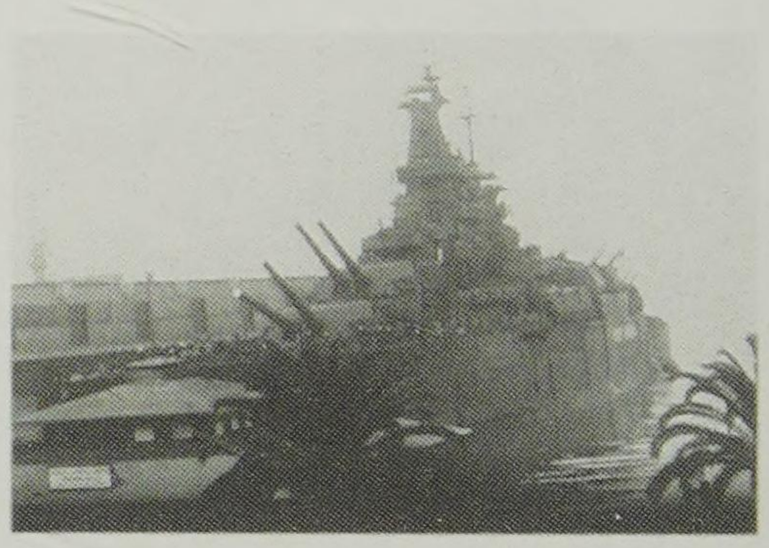
USS West Virginia Jul 1944 Ms32/7d

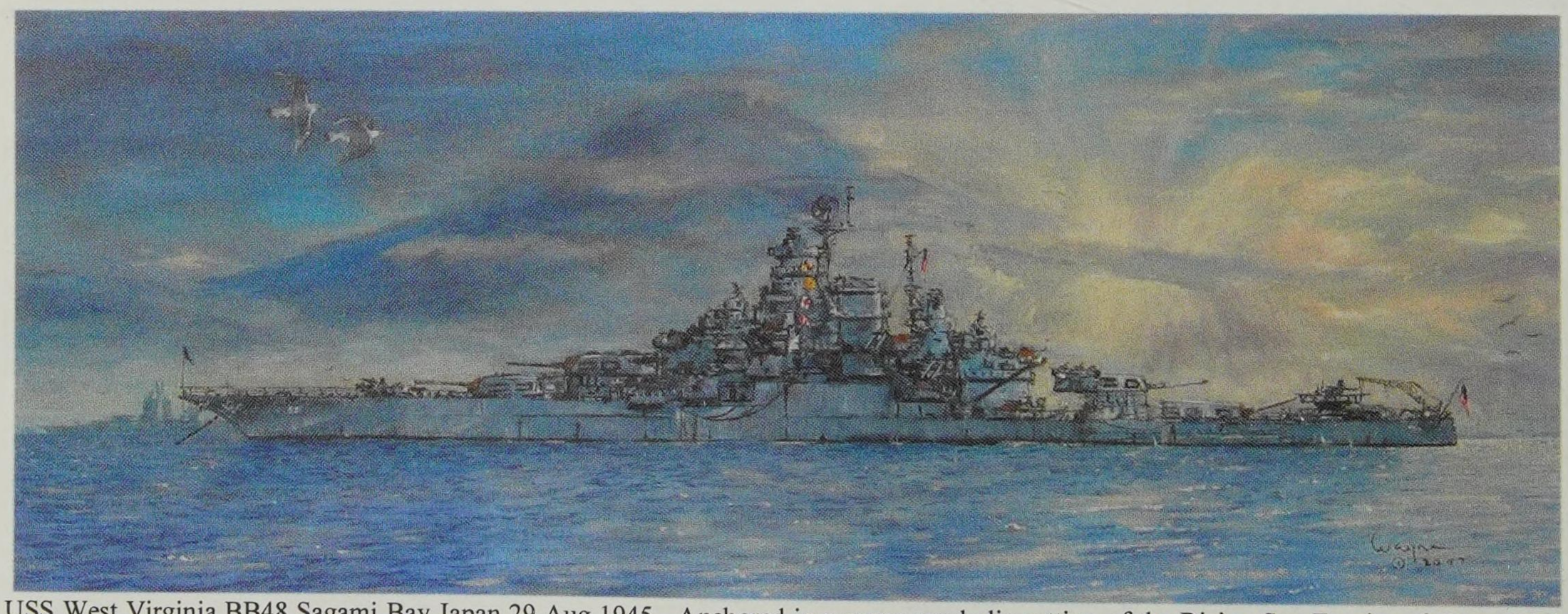


Above: circa Oct 1944 location unknown. BB48 at anchor in the Pacific. Note the dark blue awning rigged on the fantail. Alongside forward is an LCM amidships is captain's gig. This photo was intended for wartime public release and publication as all evidence of radars have been airbrushed out by a censor.

Above: 1 Apr 1945 Okinawa. BB48 on the 'bomb line' ready to provide Call fire support as required. The USN and USMC maintained trained fire support observer teams to accompany landings to call back precision instructions for fire support on specific targets.

Right 27 Oct 1945 Navy Day Broadway Pier San Diego. Note Ms21 paint and name painted on the ship's side. TN2 Esther Black USNR. dbc





USS West Virginia BB48 Sagami Bay Japan 29 Aug 1945. Anchored in a scene symbolic setting of the Rising Sun Empire of Imperial Japan. On the night of 25 Oct 1944, at the Battle of Surigao Strait, West Virginia along with Pearl Harbor survivors, Pennsylvania, Tennessee, California, Maryland, plus the not present at Pearl Harbor, Mississippi avenged themselves in what was to be the last naval action to be fought between battleships.

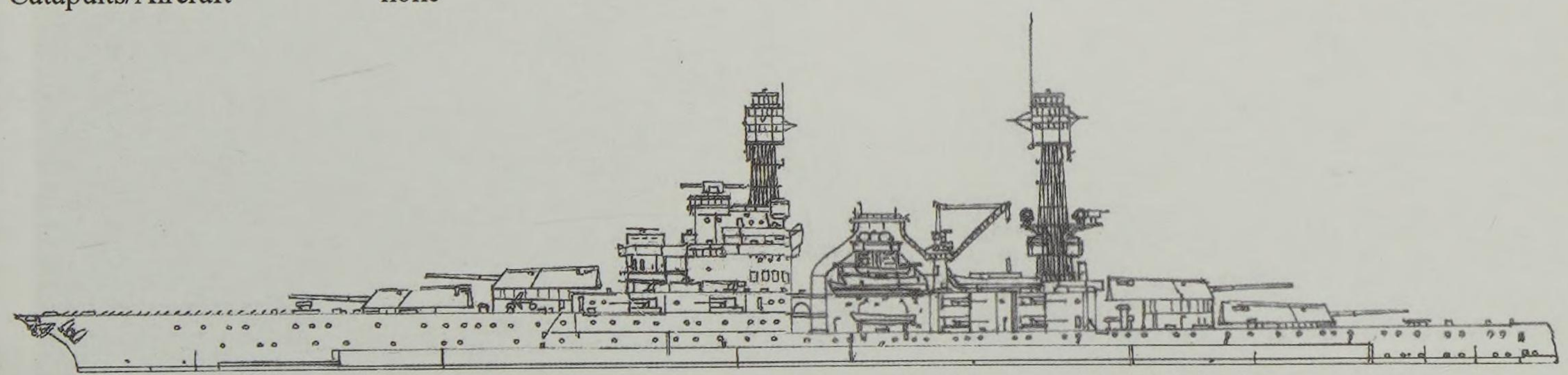
South Dakota Class 6 Battleships of 1919 (canceled):

USS South Dakota BB 49 USS Indiana BB 50 USS Montana BB 51 USS North Carolina BB 52 USS Iowa BB 53 USS Massachusetts BB 54

The South Dakota BB49 class ships were the last USN 2nd generation BB design. The BB49 class of ships was ordered to counter the 2 Japanese 38,000 ton 10 16" gun Tosa class BB's of Japan's 8-8 program of 1918 which specified 8 BB's 8 CB's less than 8 years old. The BB49 and the Tosa classes were part of an emerging BB arms race at the close of WWI between the USN, Japan and the UK which ultimately resulted in the Washington Naval Treaty of 1922. The BB49 class ships were the cumulation of the concepts of the USN's "Standard Type" battleships. These ships were to have been considerably enlarged improvements of the BB45 class fitted with 4 16/45" triple turrets. By increasing the parameters of almost every design characteristic the USN planned to achieve a class of six "super battleships" scheduled to be completed by 1925. As designed they were envisioned to outclass and be capable of clearly defeating any possible contemporary foreign (Japanese) designs. The canceled BB49 class would have introduced the 6"/51 as secondary armament. The designed featured an enlarged 'standard type' hull and standard clipper bow. Heavier armor and improved underwater protection were incorporated. As planned the design featured two cage masts topped with three level fighting tops and four thin stacks arranged in a square pattern centered amidships and curved toward a center position to be brought together under a single stack cap with a lattice searchlight platform mounted abaft the stack. Design to be equipped with sixteen oil fired boilers and Turboelectric Machinery of 60,000 SHP producing a designed top speed of 23.0 knts. Studies were performed to redesign the Montana BB51 with eight 18"/45 guns, which at the time were under development, but the project was subsequently canceled. The ships were started and approximately 20-40% complete and not yet launched when canceled. They were scrapped in place in 1922/23 to comply with the provisions of the Washington Naval Treaty.

Battleship South Dakota Class Design Statistics (1920)

Displacement	Std/FL Designed	41,400 tons/43,200 tons
Dimensions	Length WL/OA/Beam	660'0"/684' 0"/106'0"
	Draught (max)	33' 0"
Machinery	Turbo Electric	8 electric motors/ 2 per shaft
	Boilers	16 (oil fired) 575 PSI
	Shafts/designed SHP	4 shafts 60,000 shp nominal
	Rudder	single
	Max Designed Speed	23.0 knts
	Weight of Eng Plnt	2,698tons
	Fuel bunkerage/Range	2,100/8000 nm @10.0kns
	Tactical Diameter	-
	GM	3.47
Armament:	Weight of Broadside	26,880lbs/13.44tons
	Projectile Weight	2,240lbs/1.12tons
	Max range	35,000yds/19.89miles
	Rnds/Weight per Min	2.0/26.88 tons
	Rnds per gun/ Total Rnds	100/1200
	Main	12-16"/50
	Sec	16-6"/53
	AA	8-3"/50
	TT:	2-21" torpedo tubes submerged
Protection:	Main (wl) Belt/Incline	13.5"-8" tapered/0degrees
	Deck:	5.5"/3 decks
	Turret:	18"face 5"side 10" top 9" back
	Deck (total)	5.0"+5.0"@45 deg angle/3 decks
	Total Armor Weight	10,036 tons
Catapults/Aircraft	none	

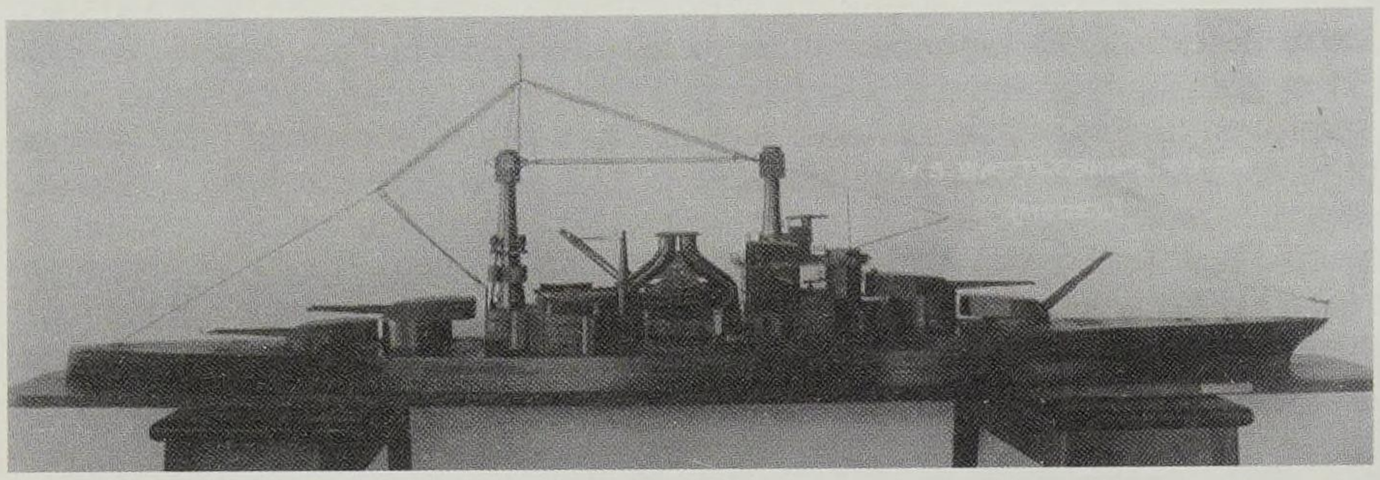


South Dakota class BB49-BB54 final design 1920

BB49-54 Class Chronology

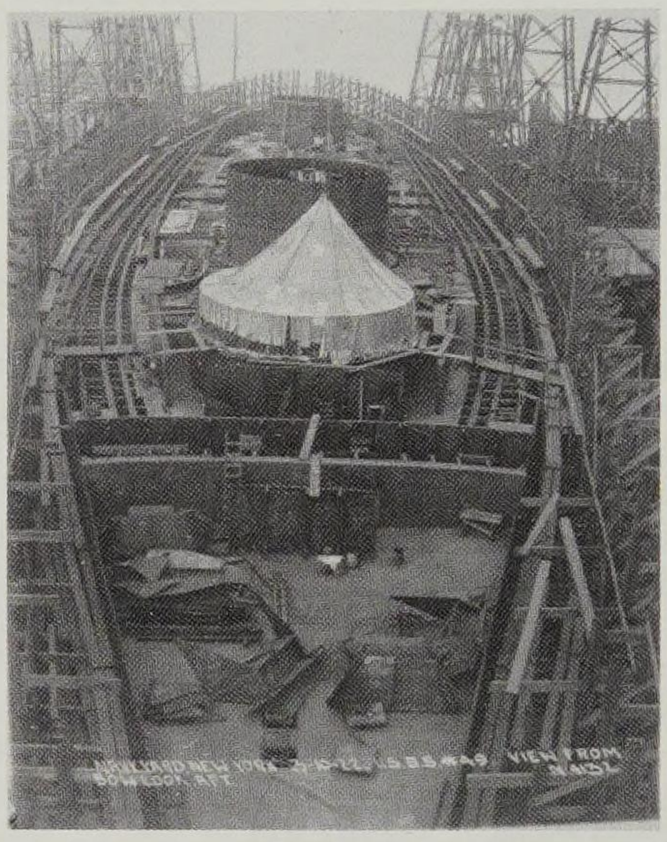
Ordered	Canceled	Stricken	Sold	Scrapped
5 Dec 1916	8 Feb 1922	24 Aug 1923	25 Oct 1923	Oct/Nov 1923

Hull No.	Builders Yard	Keel Laid	Percent Complete
BB49	Hew York NSY	30 Jun 1919	38.5%
BB50	New York NSY	11 Nov1920	34.0%
BB51	Mare Island NSY	1 Sep 1920	28.0%
BB52	Norfolk NSY	20 Jan 1920	28.0%
BB53	Newport News SBCo	12 Jan 1920	32.0%
BB54	Bethlehem Quincy SBCo	4 Apr 1921	11.0%

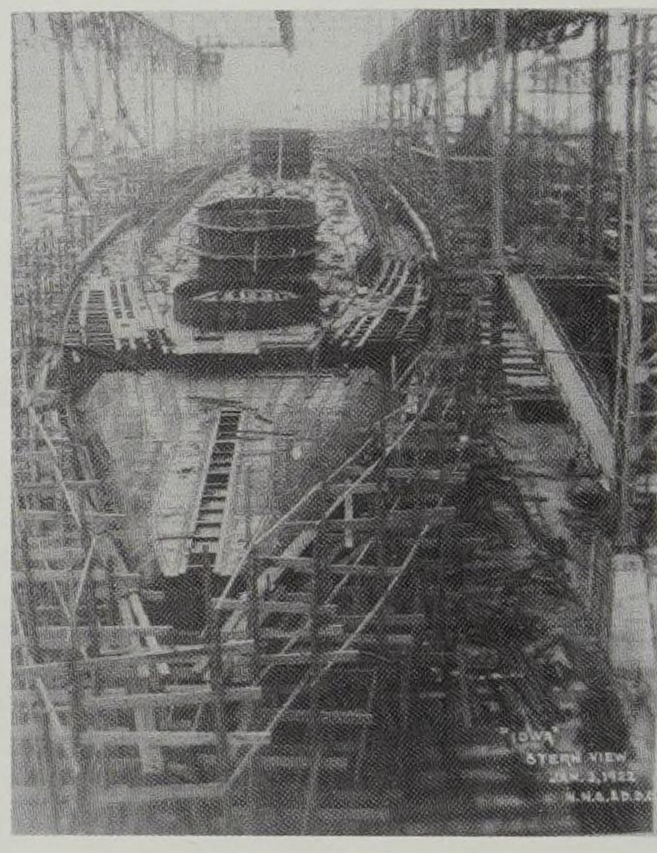


Design model of USS South Dakota BB49 Class Final Design 1922.

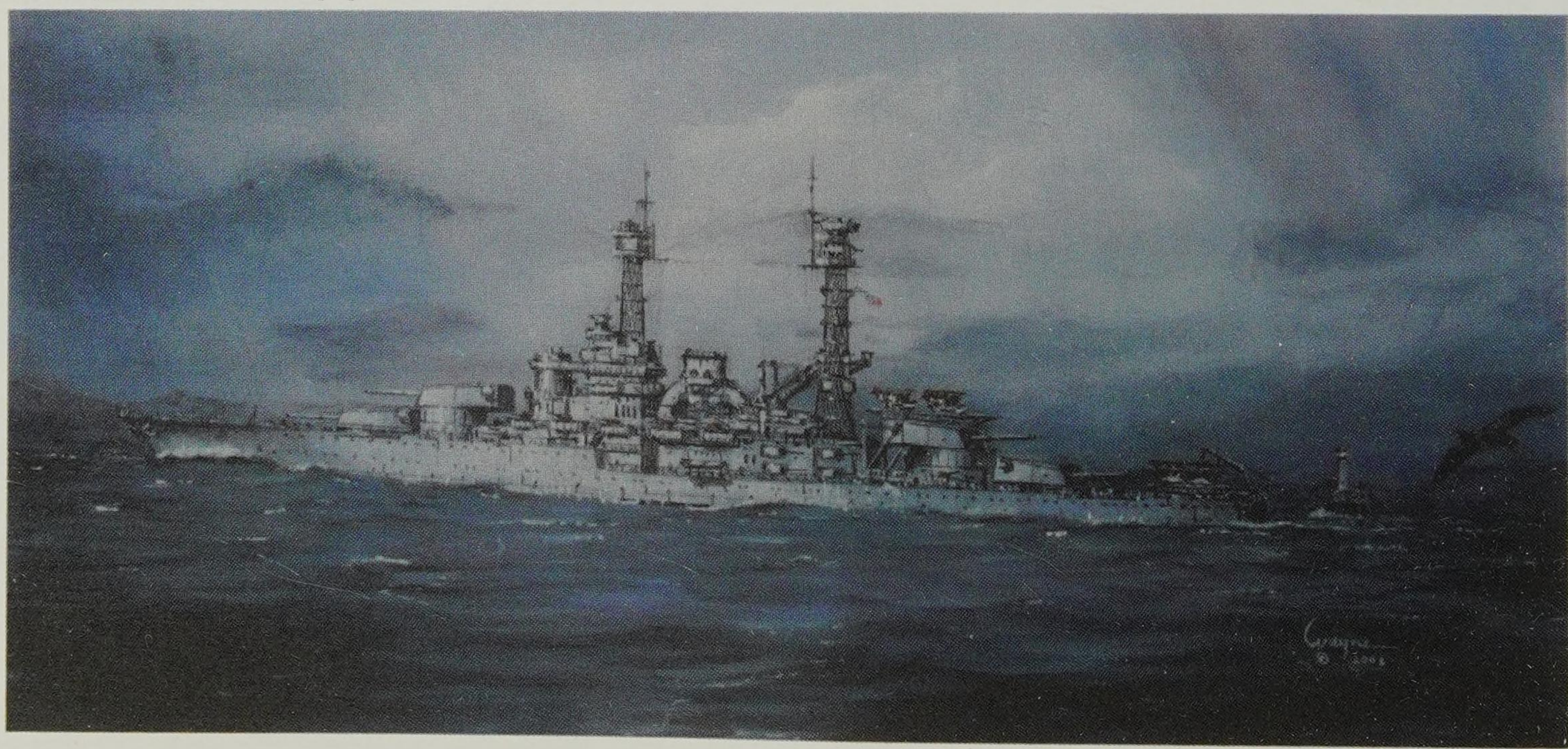
Right: 3 Oct 1922 New York NSY. USS South Dakota BB49 view to aft. Note the barbettes for the main guns are in place and the tent to keep weather off the machinery and workers on Barbette 1.



Far Right: Newport News SBCo. USS Iowa BB53 view to forward. Note slope of armor deck aft and 4 main turret barbette which are armored down to the magazine level below the armored deck.



Below: Canceled South Dakota Class Battleship USS South Dakota BB49 at St Georges light off California's Northern Coast as they would have appeared about 1935-36 after initial refits to add aircraft handling facilities . The ship is wearing a Measure 3 the 'prewar white' scheme that was worn by all USN surface ships prior to mid 1941.



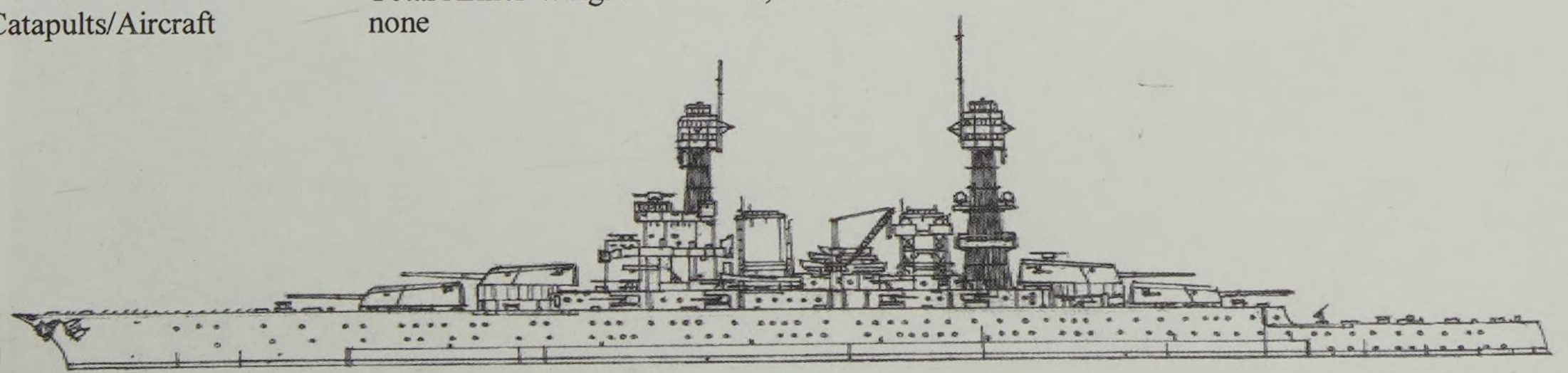
Lexington Class Battlecruisers: 5 ships of 1919 (canceled):

USS Lexington CC 1 (CV 2) USS Constellation CC 2 USS Saratoga CC 3 (CV 3) USS Ranger CC 4 USS United States CC 5

As with the complimentary BB49 class BB's the CC1 class battlecruisers were ordered to counter the 8 Japanese CC's of the Amagi class, 33,000 tons 10 16" guns. The CC1's were the first and technically only USN pure battlecruiser designs. Before and during WWI the USN senior staff viewed the battlecruiser concept of sacrificing protection and/or firepower for increases in speed with grave reservations. It was not until 1913 shortly before World War I that the USN designed a class of battlecruiser to compliment the operational capabilities of the Battleforce. As the result of experience gained in WWI the CC1 design was the subject of several redesigns to provide enhanced protection and increased survivability. In view of the catastrophic loss of three British battlecruisers at the Battle of Jutland, the CC1 class were extensively redesigned twice between 1916 and 1920. The original 1913 design had been for a 35 knt 10 14" gun 7 stacked vessel that embodied the extreme principals of battlecruiser design as featured in contemporary UK battlecruiser designs. The second was for a 35knt 8 16" gun 5 stack design with improved protection. The final redesign was for a 33knt 8 16" gun 2 stack ship. These final redesigned ships were marked improvements over the original designs, offering increased firepower, heavier armor, and improved protection systems, at the cost of a 3 knot speed reduction. The new design increased almost every design parameter achieving a much a better balanced ship. The final design featured two squat centerline stacks, 2 cagemasts with 3 level fighting tops. This was the final design of USN Capital Ship to fit the cage type masts introduced by the USN's first 'dreadnought design', the USS South Carolina BB26 class, in 1910. The cagemast design was intended to damper vibration and shock from firing of the main battery as to not disturb the delicate fire control observation procedures in the fighting tops. The ships were also scheduled to complete by 1925 contemporarily to the BB49 class. Construction of all 6 ships was started and 4 were canceled when approximately 20-40% complete. The 4 canceled ships were scrapped prior to launch in 1922 to comply with the provisions of the Washington Naval Treaty. As permitted by the provisions of the Washington Treaty the remaining 2 hulls under construction were modified to fleet aircraft carriers and were completed as USS Lexington CV2 and USS Saratoga CV3 in 1925. The completion of these two ships as CV's in the interwar years was invaluable to the USN. As they provided the ability to develop and refine the carrier tactics so successfully deployed in WWII. The two carriers served during WWII, with CV2 lost at the Battle of the Coral Sea on 8 May 1942. CV3 survived the war, and was expended as an atomic bomb target ship at Operation Crossroads in Jul 1946. Design details of these ships are omitted as aircraft carriers, as their design type is outside the scope of this volume.

Lexington Class Design III (1920) Statistics

Displacement:	Standard Designed	43,500 tons
Dimensions:	Length WL/OA/Beam	850'0"/874'0"/105'5 ¼"
	Draught (max):	31' 0"
Machinery	Type: Turbo Electric	4-Turbines 8 electric motors/ 2 per shaft
	Boilers	l6 (oil fired)
	Shafts/designed SHP	4 shafts 180,000 shp nominal
	Rudder	single
	Max Designed Speed:	33.25 knts
	Fuel bunkerage/Range:	2,000/10,000 nm @120kns
	Tactical Diameter	640 yds @ 21 kns
	GM	4.3
Armament:	Weight of Broadside:	17,920lbs/8.65tons
	Projectile Weight:	2,240lbs/1.12tons
	Max range:	35,000yds/19.89miles
	Rnds/Weight per Min:	2.0/17.3 tons
	Rnds per gun/ Total Rnds	100/800
	Main	8-16"/50
	Sec	16-6"/53
	AA	4-3"/50
	TT:	8 21" torpedo tubes 4 submerged 4 above water
Protection:	Main (wl) Belt/Incline	7"-5' tapered/11 degrees
	Deck:	1.75"/3 decks
	Turret:	11"face 5"side 6" top 8" back
	Total Armor Weight	6,160 tons
Catapults/Aircraft	none	



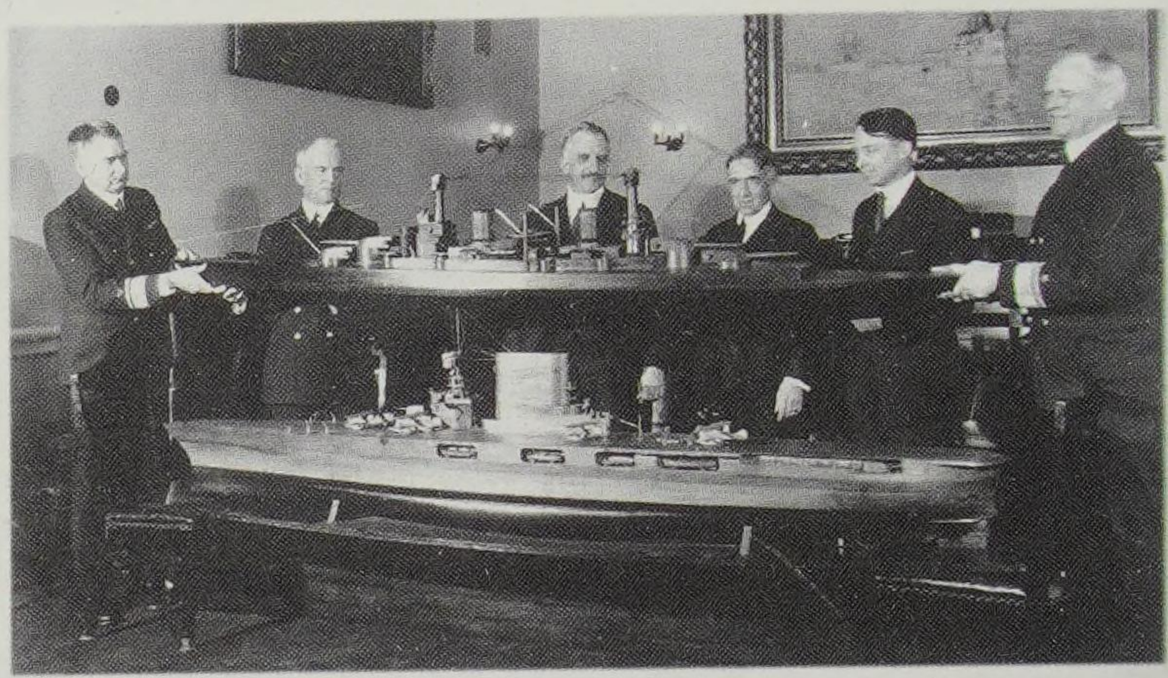
USS Lexington CC1-CC6 Final Design 1922

CC1-6 Class Chronology

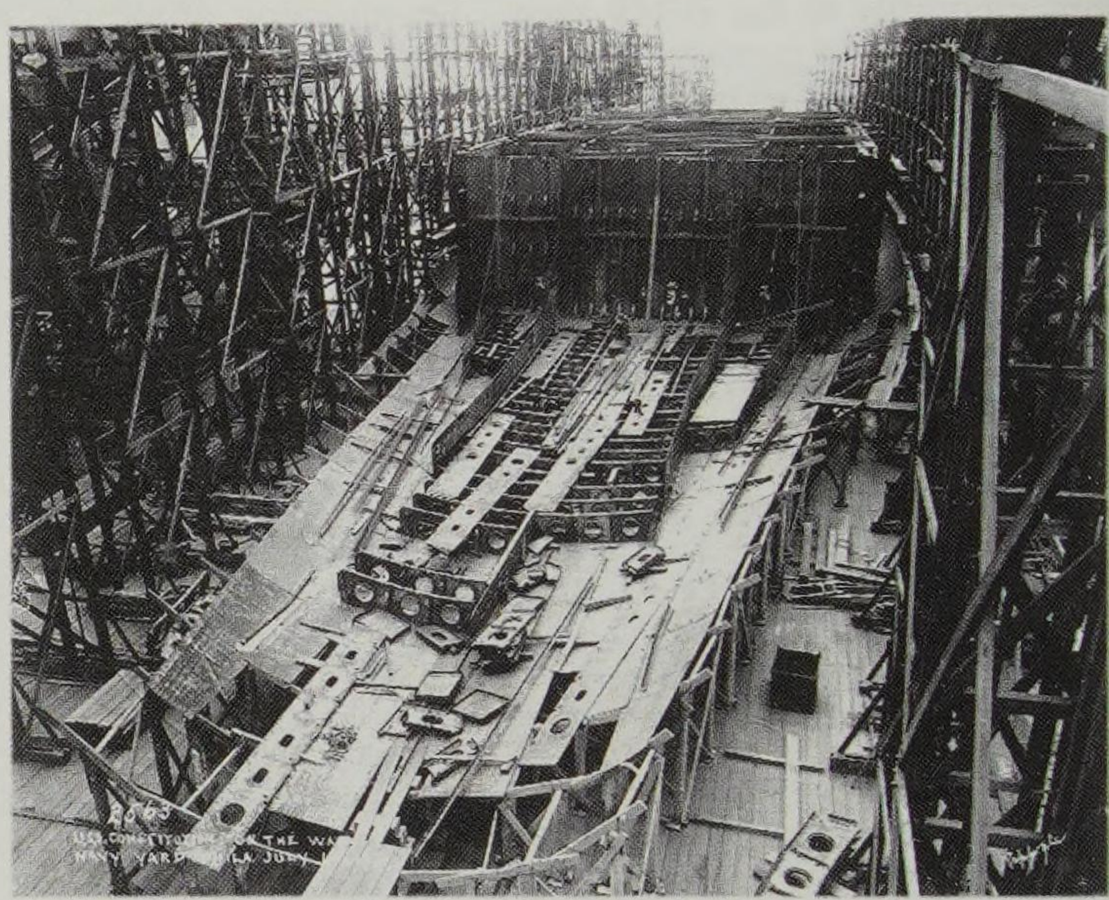
Ordered	Canceled	Stricken
5 Dec 1916	8 Feb 1922	25 -27 Aug 1923

Hull No.	Builders Yard	Keel Laid	Complete
CC1	Fore River Quincy	8 Jan 1921	26.7 %
CC2	Newport News SBCo	18 Aug 1920	22.7%
CC2	New York SBCo	23 Sep 1920	29.4%
CC4	Newport News SBCo	23 Jun 1921	4.0%
CC5	Philadelphia NSY	25 Sep 1920	13.4%
CC6	Philadelphia NSY	25 Sep 1921	12.0%

Right: 8 Mar 1922 Bureau of Construction and Repair Washington NSY. Design models of the scheme III Battlecruiser CC1 and the redesigned CC1 as the Lexington CV2 class Aircraft Carriers.

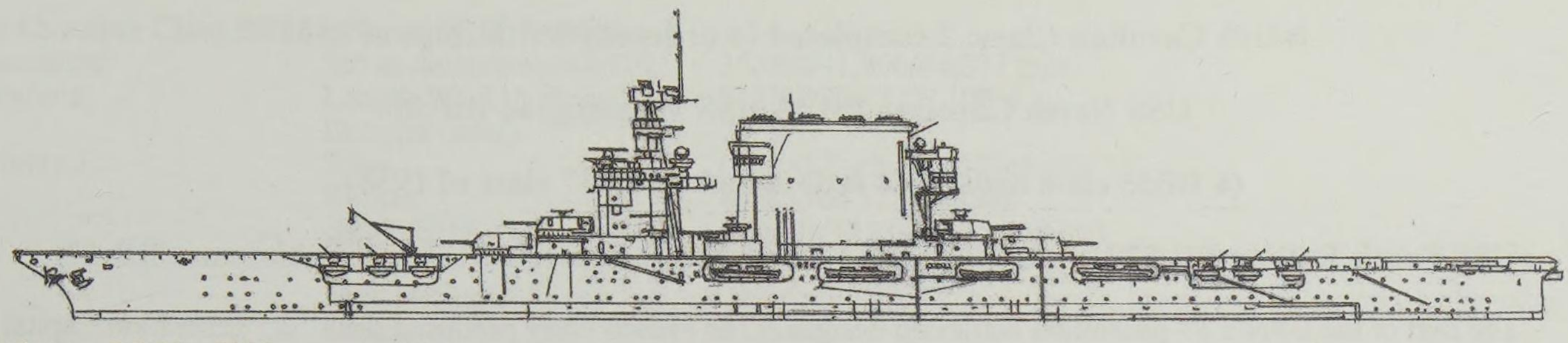


Above: 30 Sep 1921 New York SBCo. USS Saratoga CC3 View to aft. Note the scaffolding array use to provide access for construction. And the longintunal keel beam.

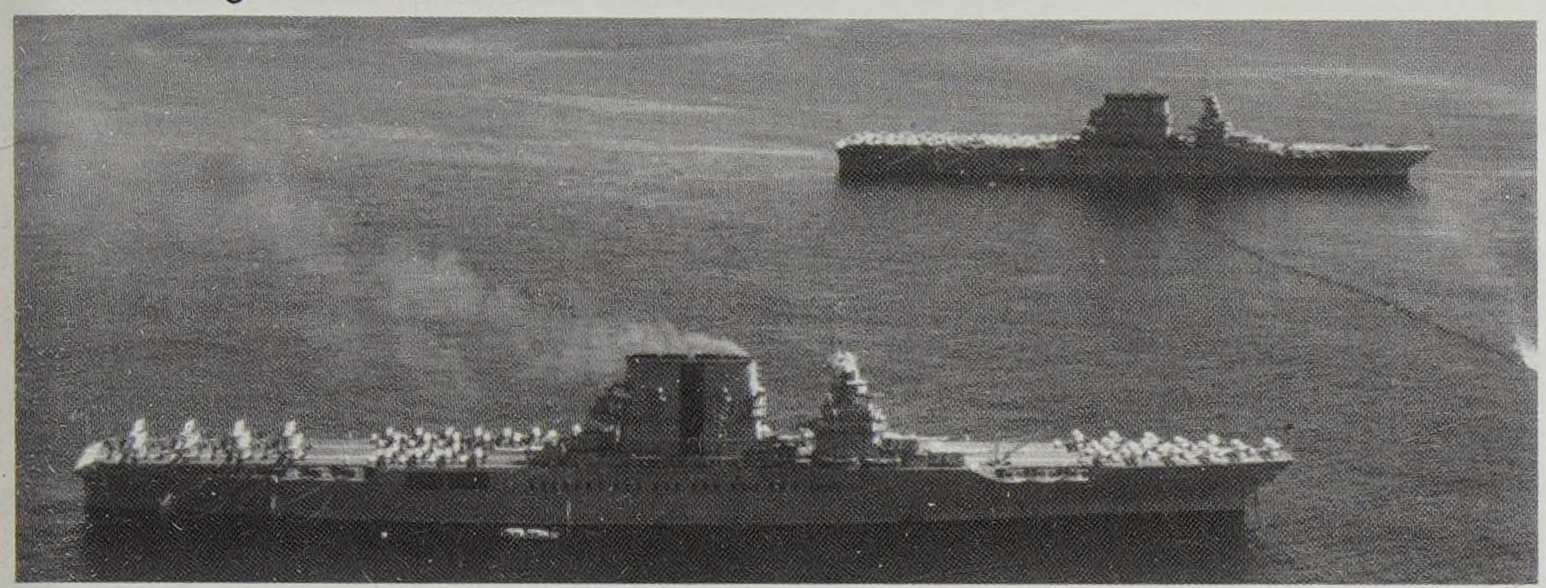


Right: 14 Jul 1921 Philadelphia NSY. USS Constitution CC5 under construction. Note the transverse bulkheads.

Below: The canceled Lexington Class Battlecruiser USS Lexington CC1 off New York Harbor 1930. Steaming close aboard the Lightship Ambrose, which for many years marked the outer entrance to the Ambrose Channel which led to New York Harbor. Lightships were manned by the US Coast Guard and were anchored on station for months at a time. Their crews endured isolation and hardship in all types of weather to provide the navigation aids necessary to provide safe passage for other vessels. Lighthouses were dark, outer harbor buoys and lightships were removed during WWII to deny navigation reference points to enemy forces.

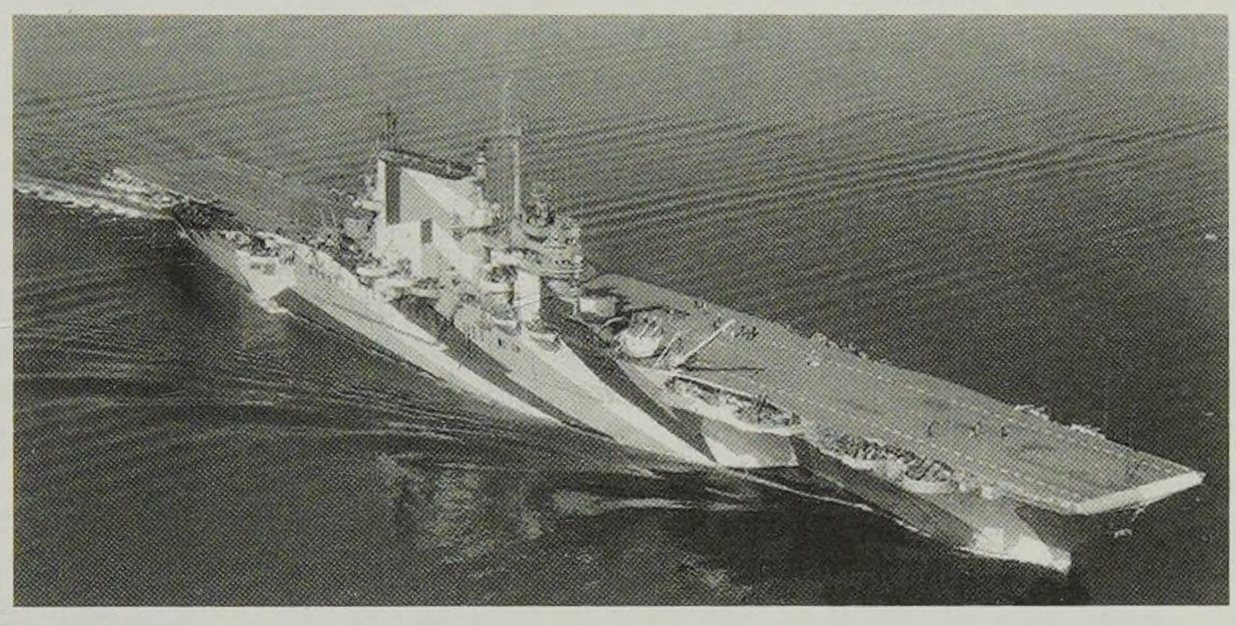


USS Lexington CV2 Mar 1929



2 Feb 1932 Lahina Roads Oahu HI. CV3 foreground and CV2 background. Note the black identification stripe painted on the stack of CV3. Note the massive relative size of the ships stacks. Which made the CV2 class ship's silhouette unmistakable. In early 1945 CV3 had the height of the stacked reduced. The original 8" armament was removed from CV2 prior to the ship's loss and in 1942 CV3 had the 4 8'"twin turrets replaced with 4 twin 5"/38 DP mounts.

7 Sep 1944 Puget Sound NSY. CV3 underway on post refit trials. Note the wide flight deck forward, as completed the contours of the flight deck followed the hull contours more closely. This overhaul followed the completion of the CV3's UK Far Eastern/Pacific Fleet assignment in early 1944. The CV3 operated with the British Far Eastern Fleet in the Indian Ocean in Mar-May 1944. The USN provided the Royal Navy with the CV3 per FADM King primarily to train British airmen and sailors on USN flight operations with USN aircraft, and the highly successful USN carrier task force defensive and offensive tactics and operations. The UK CV HMS Victorious had operated with the CV3 under USN control in the Solomons Area May-Sep 1943.



Below: USS Saratoga CV3 (CC3) Lexington Class Fleet Carrier off Coast of Japan Feb 1945. During 1945 CV3 operated with a night carrier group providing support to the fast carrier striking force, with night fighter coverage against nocturnal incursions. CV3 is painted according to Ms32/11a which was developed expressedly for CV3. The CV3 spent most of WWII painted Ms21.

North Carolina Class: 2 completed (6 ordered) Battleships of 1937

USS North Carolina BB 55 USS Washington BB 56

(6 BB55 class ordered/4 redesigned as BB57 class of 1938)

(USS South Dakota BB 57 USS Indiana BB 58 USS Massachusetts BB 59 USS Alabama BB 60)

The first of the USN's 3rd generation battleship designs. (The French Navy produced the 1st 3rd generation Capital Ship Dunkerque class CB design in 1934) The BB55 class ships were the cumulation of an extensive and protracted design process to produce the optimum ship within the constraints of the Washington Naval Treaty. These ships were the first new battleships to be built in 19 years for the USN (since 1919). The BB55 class designs were radical departures from the USN's 2nd generation designs, featuring extensive improvements over the canceled South Dakota BB49 class ships of 1922. The final design scheme XVII BB55 design that was completed defined the characteristics of successive classes of USN 3rd generation BB's. High speed, heavy armor, nine gun, three turret 16" main battery, with a 20 gun 5"/38 DP secondary battery disposed in 10 twin gunhouses, a large medium/light AA battery mounted on a 'pyramid style' superstructure based around a tall forward fire control tower.

The original single stack 14" armed North Carolina class design that was approved and ordered (scheme XVI) mounted a main battery of 12 14"/50's Mk11's carried in three quadruple turrets disposed two forward and one aft. The secondary battery was comprised of 16 5"/38's DP's disposed in 4 single and 6 twin mounts on the 01 and 02 levels. A single large slightly raked stack was located aft of a tall fire control tower atop the aft end of the bridge structure and forward of a medium height after main battery fire control tower. 4 Mk37 DP directors in a diamond pattern were fitted. A long sweeping single level maindeck with a clean hull line with an external armor belt was fitted upper hull portholes, and a slightly bulbous bow were incorporated. Armor protection was provided against 14" gunfire. Displacement was 35,000 nominal standard (41,000 actual). These scheme XVI ships as ordered were the first USN BB design to include aircraft handling facilities of two catapults and a medium duty crane on the fantail, and was the only USN BB design that included a below deck hanger, and aircraft elevator.

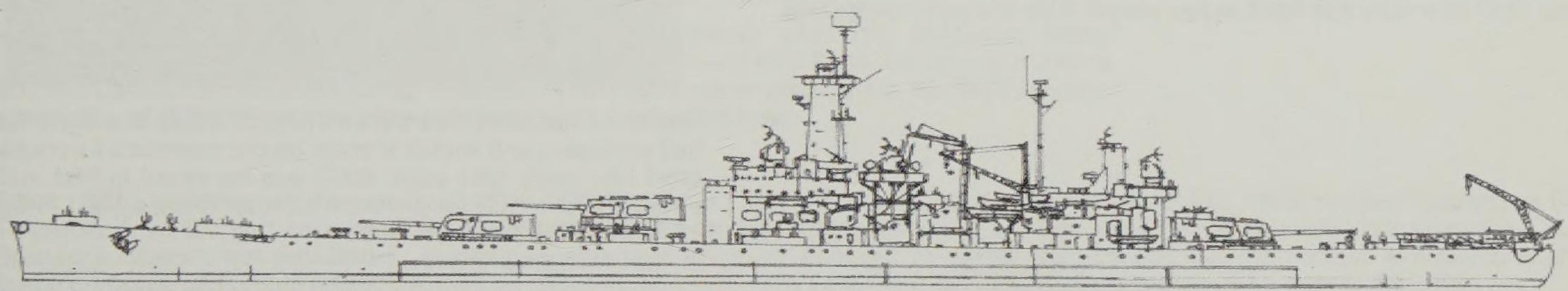
In view of reported BB developments in Japan, and Germany, the gun caliber 'escalator clause' of the London Naval Treaty of 1930 (which permitted an increase in the caliber of the main armament be upgraded from 14" to 16") was invoked by the United States in 1938. The decision was made to rearm the first two ships of the class with nine 16"/45's Mk6, disposed in three triple turrets (2 forward and 1 aft) Secondary armament was increased to 20 5"/38 DP's in 10 twin mounts with 4 sited on the maindeck 01 level, and 6 atop the deckhouse 02 level. The ships were given two tall thin stacks with raked stack caps, set well aft of amidships, with the after stack lower than the forward stack. As the first 2 ships were to far advanced in construction to permit any redesign to increase the armor protection to be able it to defeat 16" gunfire. Therefore, the 14" gunfire protection scheme was retained. This resulted in an unusual (for the USN) 'unbalanced design' as USN BB's were generally designed to be able to defeat their own caliber of gunfire at normal battleranges. As construction on the last four ships was not so sufficiently advanced as to preclude redesign of the armor protection systems, the decision was made not to complete them to the BB55 design. But instead to redesign them to new class that was to be a more 'balanced design' which could offer reasonable protection against 16"/45 gunfire. These four redesigned BB55 class ships (BB57-BB60) became the subsequent South Dakota BB57 class.

In spite of being an 'unbalanced design' the BB55 class proved to be very satisfactory ships in service. BB55 validated USN protection systems design theories when the ship was struck in Sep 1942 by a Type 93 24" Japanese 'Long Lance' submarine launched torpedo (1,080lbs warhead) with minimal damage and very little impact to the ships speed, or weapon capabilities. The BB55's were fair seaboats, but as a result of their somewhat low freeboard, they tended to be 'wet' forward in a seaway, or at speed although not as severely as many contemporary foreign designs. As completed the ships experienced vibration problems at high speeds. Efforts to resolve the vibration issues resulted in delays to the ships attaining full operational status (IOC) (it had been intended to deploy BB55 with BB56 to the UK's Home Fleet in 1942 but BB55 remained in the US to address the vibration problem). The vibration issue was extensively evaluated by the USN on BB55 with various modifications and reconfiguring of the screws and shafts tried. With these changes, the high speed (over 23 kns) vibration was reduced, but the problem was never fully resolved. The ultimate solution was the recommendation not to operate over 23 knots for prolonged periods unless required by operational necessities. In spite of the design's shortcomings and by the overbuilding of all design parameters in the protection system, coupled with the extremely efficient high pressure, high temperature geared direct drive turbine engineering plants. The BB55 class ships were considered to be overall superior to most foreign treaty built 35,000 ton designs. The BB55 and BB57 class like all foreign BB designs exceeded the 35,000 standard displacement clause of the Washington Naval Treaty. The BB55 and BB57 classes had actual standard displacements of 41,000 tons the German Bismarck's were 42,000 the Italian Littorio's 41,000, with the British King George the V class at 37,000. But all nations involved insisted their BB's complied with the 35,000 ton limitation by defining their ships displacement as having a 35,000 ton 'nominal standard' displacement.

In the 1946 fleet estimates the USN planned to keep both BB55's in service in the postwar fleet while relegating the 4 BB57 class ships to ready reserve status. But due to postwar budget levels both ships were place in reserve by 1948. Studies were conducted in the 1950's to determine the feasibility of upgrading the speed of the BB55 class ships to enable them to maintain the sustained high speeds (33+kns) required to keep pace with the fast carrier groups. The study concluded that with the rebuilding of the contours of the stern, and redesigning the propeller shafts and skegs that it was possible. But due to cost constraints and lack of an operational requirement the conversions were never authorized. The BB55 class were also evaluated for potential conversion to Helicopter Assault Ships (LPH), and Fast Replenishment Ships (AOE) However, no conversions were authorized due to general unsuitability of the ships and level of complexity and cost of the suggested conversions. The USN maintained reactivacation plans for these ships up to the time of their disposal in the early 1960's. The BB55 was placed in reserve in 1947, stricken in 1960 and loaned to the State of North Carolina as museum ship. In 1961 BB55 was towed to Wilmington North Carolina and opened to public display. As a museum ship BB55 was painted Ms13 with large shadowed hull numbers which the ship had never worn in active service. In 1998 paint was changed to Ms 32/18d BB55 wore 1943-1944. BB56 was placed out of commission in 1947 stricken and sold for scrap in 1960.

North Carolina Class BB55 (scheme XVI) Statistics

Displacement:	Std as designed/actual/Fl		35,000/41,000/44,377 tons
Dimensions:	Length WL/OA Beam		713'8"/728'11"/ 108'4
	Draught (max)		29' 9"
Machinery	Type		Geared Turbines 4-Turbines
	Boilers		8 oil fired 575psi 850F
	Shafts/SHP		4 shafts/121,000 shp nominal
	Rudder		twin
	Max Designed Speed		27.0 knts
	Weight of Eng Plnt		3181.6
	Fuel bunkerage/Range		5011.7tons/13,050nm @15.0kns
	Tactical Diameter		983 @ 27.5kns
	GM		8.94
Armament:	Weight of Broadside		24,300 Lbs/12.5tons
	Projectile Weight		2,700lbs/1.35tons
	Max range		36,900yds/20.9miles
	Rnds/Weight per Min		2.0/25 tons
	Rnds per gun/Total Rnds		130/1170
	Main		9-16"/45 (12-14"/45 scheme XVI)
	Sec		20-5"/38 (12-5"/38 scheme XVI)
	AA	1942/45	24-1.1" 18 .50cal
		1945	60-40mm 46-20mm BB55
		1945	60-40mm 56-20mm BB56
		1946	52-40mm 8-20mm
Protection:	Main (wl) Belt/Incline		12.0"-6.0"/15degress
	Deck		7.07"/ 3 decks
	Turret		16.0 face 9.0" side -top - back
	Deck (total)		4.1" /3 decks
	Total Armor Weight		8,121.1 tons (min)
Catapults/Aircraft	2 Cats 3 (4) Aircraft		



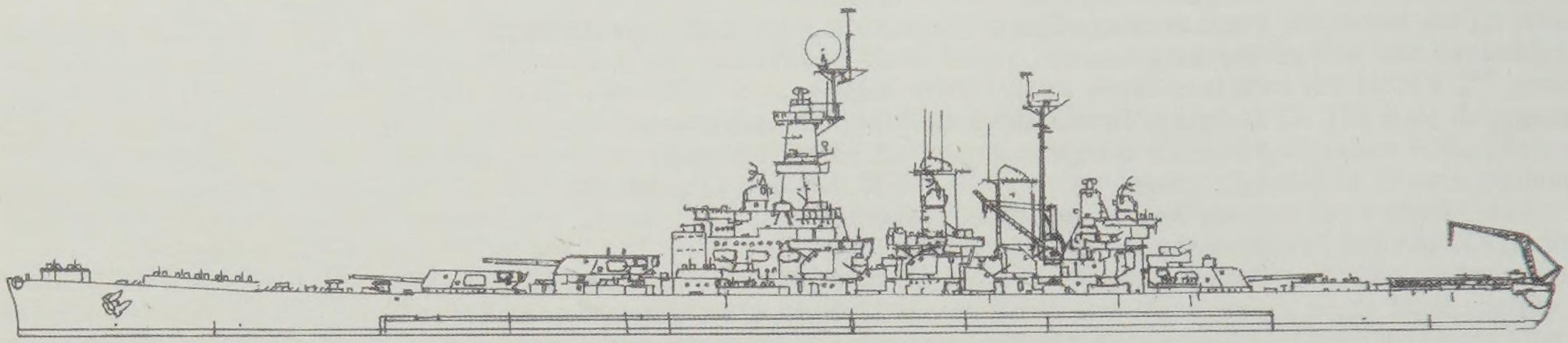
North Carolina class BB55-BB60 'as ordered' 1937 design scheme XVI

The USS North Carolina BB55 class 'as ordered' to the 1937 design (scheme XVI) Southwestern Pacific Aug 1941. The projected appearance of the original design of the BB55-BB60 class. The design mounted 12 14"/50 guns in 3 quadruple turrets with a mix of 4 single and 6 twin 5"/38 DP battery. The design featured a single racked stack set well aft. Ms1 camouflage scheme with a Ms5 False Bow wave.

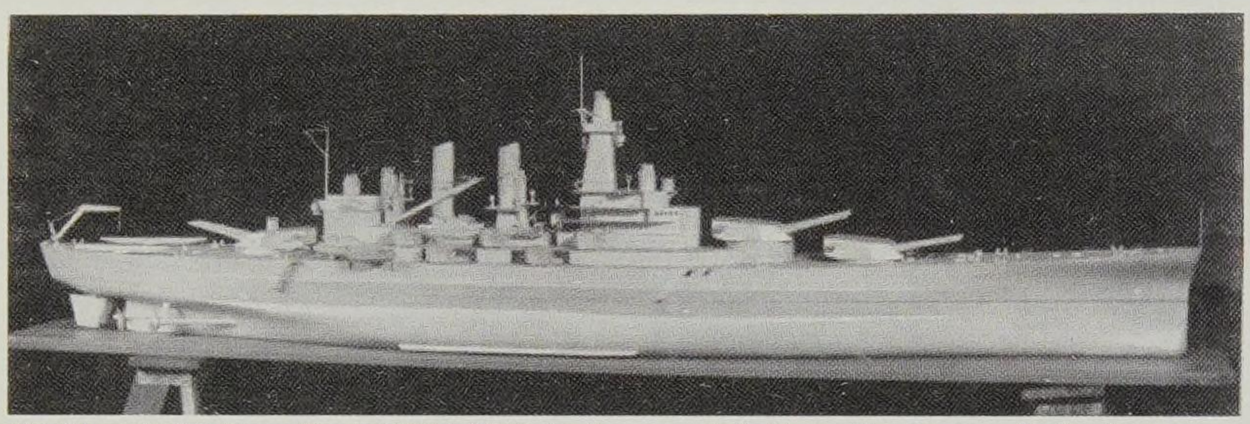
Battleship USS North Carolina BB55 Call Letters: **NIBK**

Builders Yard	New York NSY Brooklyn NY		
Reserve Group	Bayonne NJ		
Scrapping Yard			
Museum Location	Wilmington NC 1962		
Ordered	Keel Laid	Launched	1st Comm
1 Aug 1937	27 Oct 1937	13 Jun 1940	9 Apr 1941
Decom	Stricken	Transferred	Dedicated
27 Jun 1947	1 Jun 1960	6 Sep 1961	29 Apr 1962

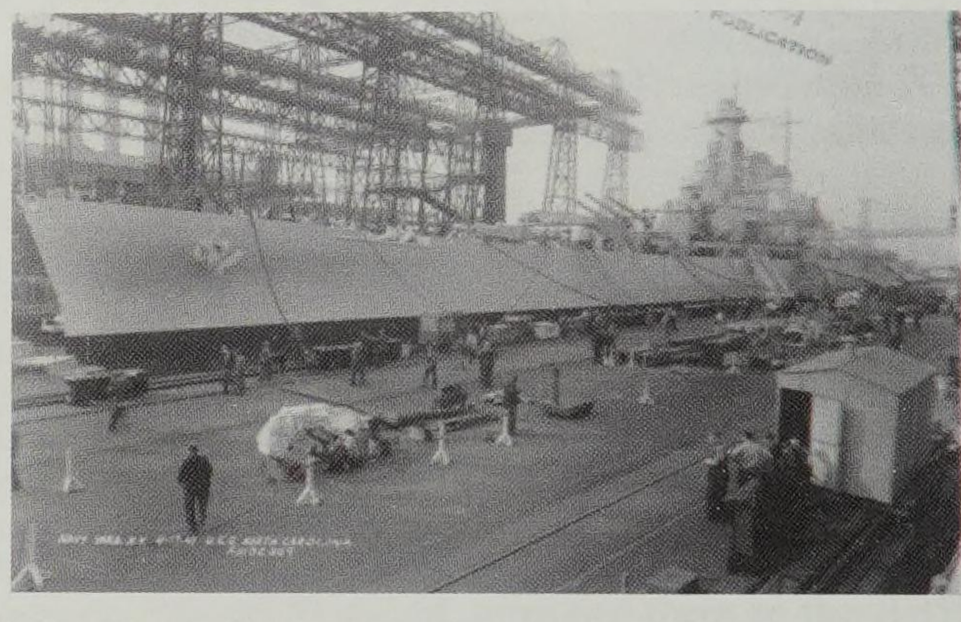
Active Service Years: 6.2



USS North Carolina BB55 Nov 1944 Ms32/18d "as built design" scheme XVII



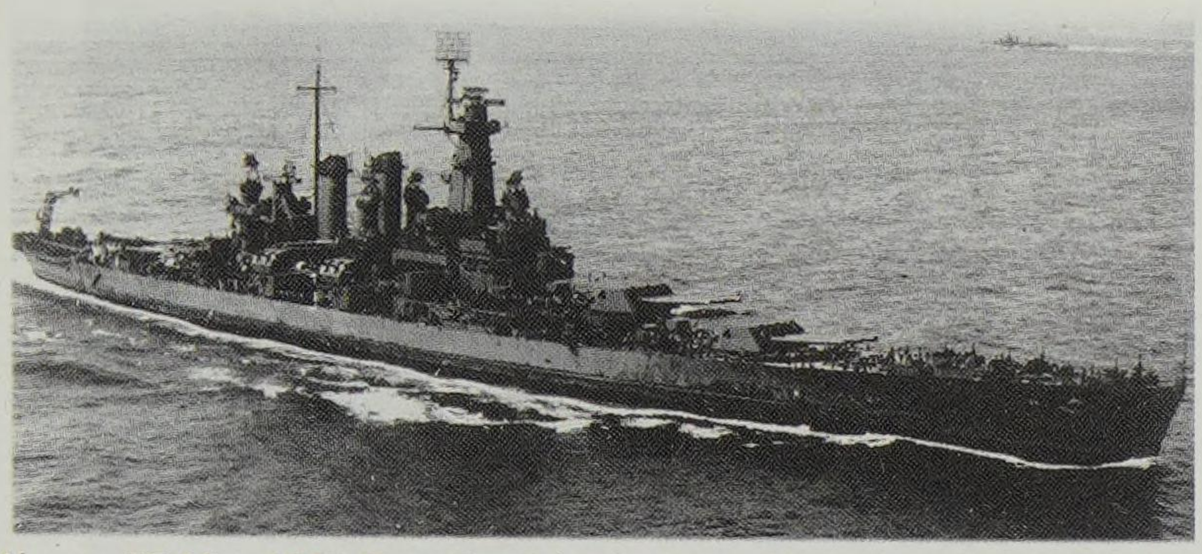
30 May 1937 New York NSY BB55 design model. Note the inner shaft skegs.



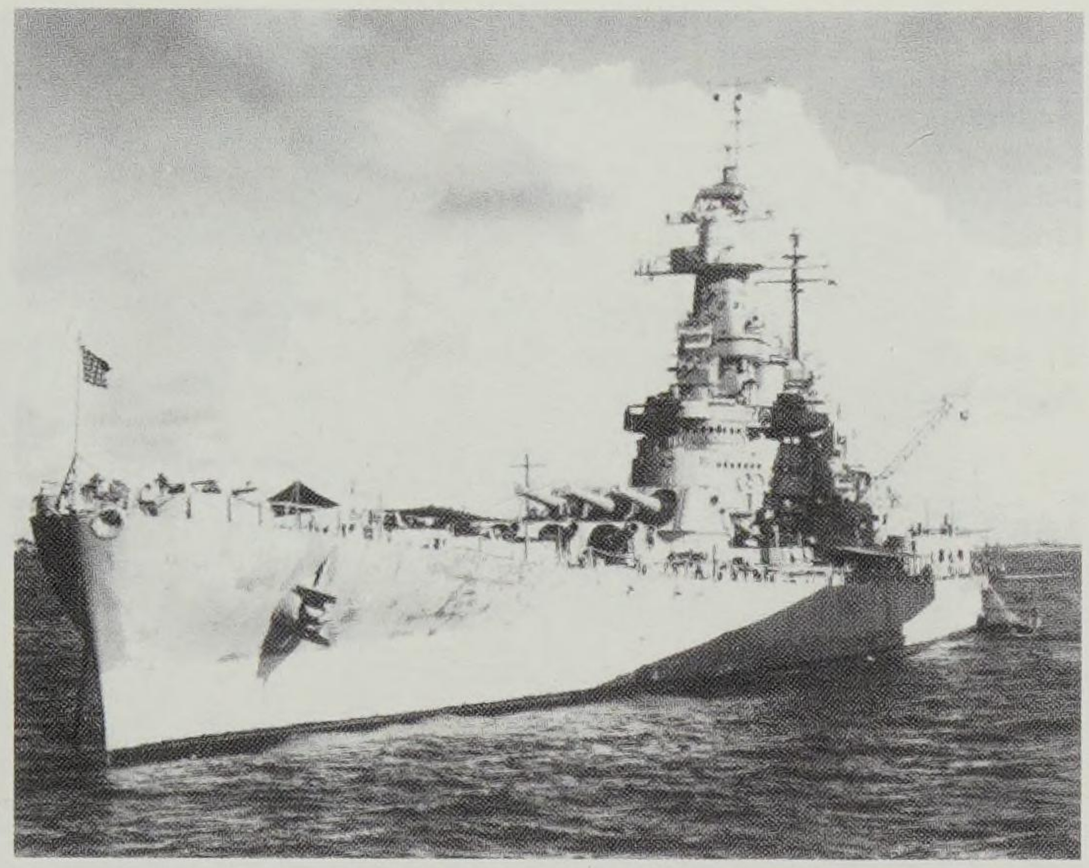
Above: 14 Apr 1941 New York NSY. BB55 fitting out. Note the hull portholes, and anchor storage on the maindeck forecastle (port side only). Ms3 paint. BB55 was repainted in Ms1 with possibly with a Ms5 (or a worn Ms1 resembling a Ms5) in Oct 1941. BB56 completed in Ms1.

Left: 16 Nov 1942 Pearl Harbor Channel. Note the Mk3mod1 radars mounted atop the Mk38 main battery directors. BB55 shipped a 1.1 and .50cal AA battery at this time. The ship retains the deck anchor. Paint is Ms12.

The USS North Carolina BB55 off the Solomons, close aboard the starboard beam of the USS Enterprise CV6. Both ships operated in the Solomons area to support the ground forces on Guadalcanal. During this time the BB55 and BB57 were the only heavy escort units in the aircraft carrier's task group. BB55 was the primary heavy escort ship for the Enterprise thru the epic air and sea battles that swirled on the waters and in the skies around Guadalcanal.



Above: 27 Mar 1943 Hawaiian Islands Operations Area. BB55 in Ms21. Note the CXAM1 radar atop the foremast, absence of a 2nd SG set atop the mainmast and the single SG set on the front of the forward fire control tower, and that the Mk3mod0 radars atop the main battery directors are still in place.



Above: 21 Nov 1944 Ulithi Lagoon, Caroline Islands. BB55 at anchor with the port boat crane swung out. Note the bow flare, and the hull flare for the anchor hawsepipe added to clear the underwater bulge of the bulbous bow, the externally mounted waterline armor belt and the sun awnings rigged on the forecastle. BB55 differed from BB56 by having had a platform deck fitted halfway up the forward fire control tower in 1943. Notice also the relatively low freeboard that resulted in these ships having a tendency to be wet forward at speed or in a seaway.

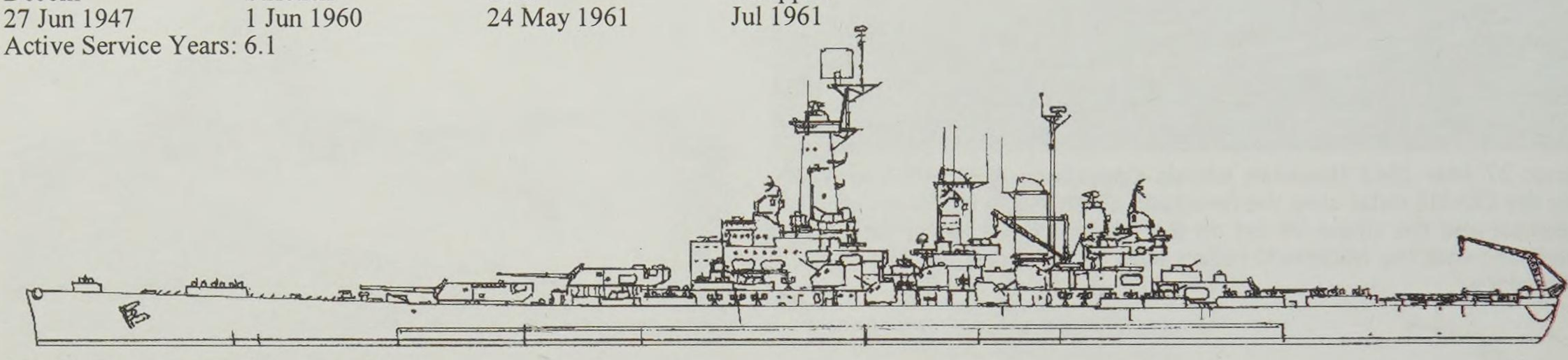
Above: 24 Sep 1944 Puget Sound NSY. Underway on post overhaul trials. The BB55 wore Ms32/18d before, and after the Jul-Sep 1944 yard period. It was usual for a BB to be repainted into a different Camouflage Measure during overhauls. There were minor variations in the BB55's pattern notably the addition of a vertical stripe of Ocean Gray on the stbd bow.

Below: BB55 underway off the port beam of the USS Enterprise CV6 in Jul 1943 in the Southwestern Pacific. BB55 has just launched an O2SU Kingfisher from the port catapult. USN 3rd generation BB's carried 2 catapults and 3 aircraft aviation sections until 1949 when the Catapult Floatplane Program was terminated. Floatplanes were used originally intended for spotting BB gunfire over the horizon. But search missions, liaison purposes, and rescue operations were all added in the 1930's. The versatile O2SU was a very popular aircraft type in the USN.

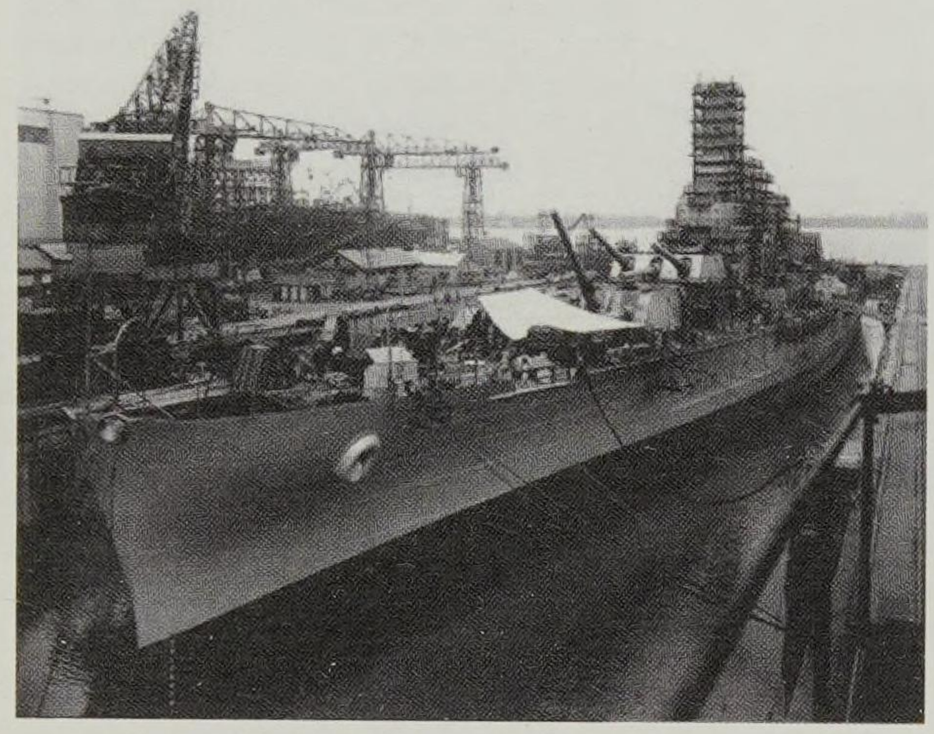
Battleship USS Washington BB56 Call Letters: **NDIC**

Builders Yard	Philadelphia NSY PA		
Reserve Group	Bayonne NJ		
Scrapping Yard	Lipsett Co Kearny NJ		
Ordered	Keel Laid	Launched	1st Comm
1 Aug 1937	14 Jun 1938	1 Jun 1940	15 May 1941
Decom	Stricken	Sold	Scrapped
27 Jun 1947	1 Jun 1960	24 May 1961	Jul 1961

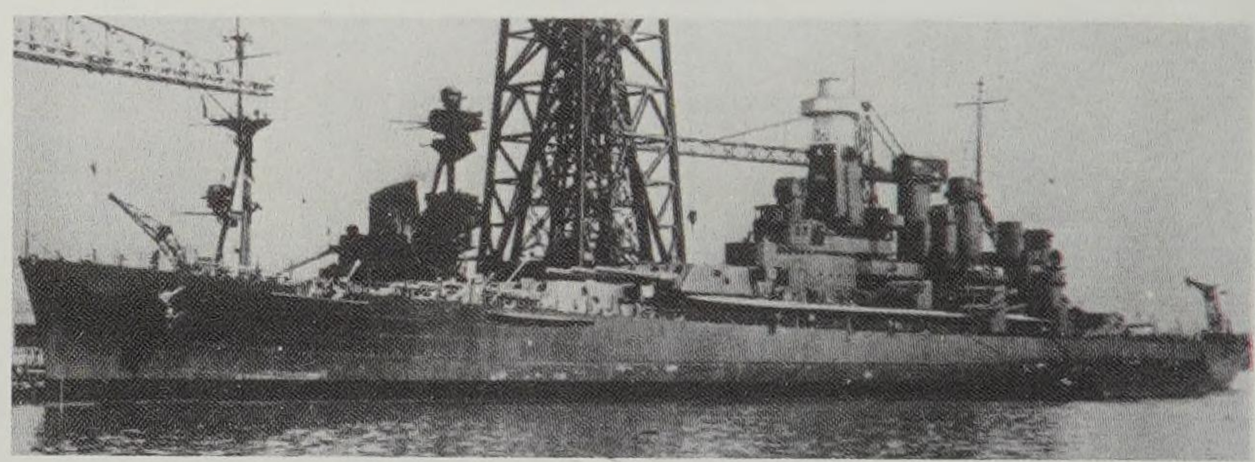
Active Service Years: 6.1



USS Washington BB56 Aug 1945 Ms22



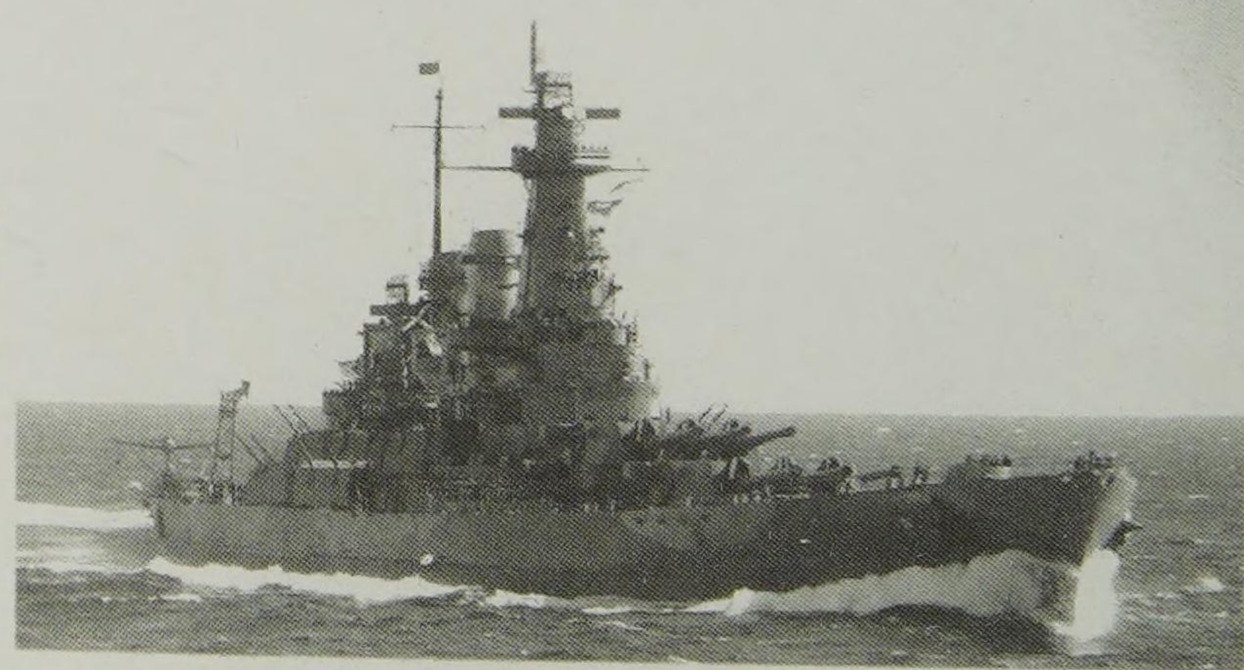
Circa Sep 1941 PhNSY. BB56 fitting out, note the deck anchor and hull portholes, which were plated over prior to starting trials. Paint is Ms3.



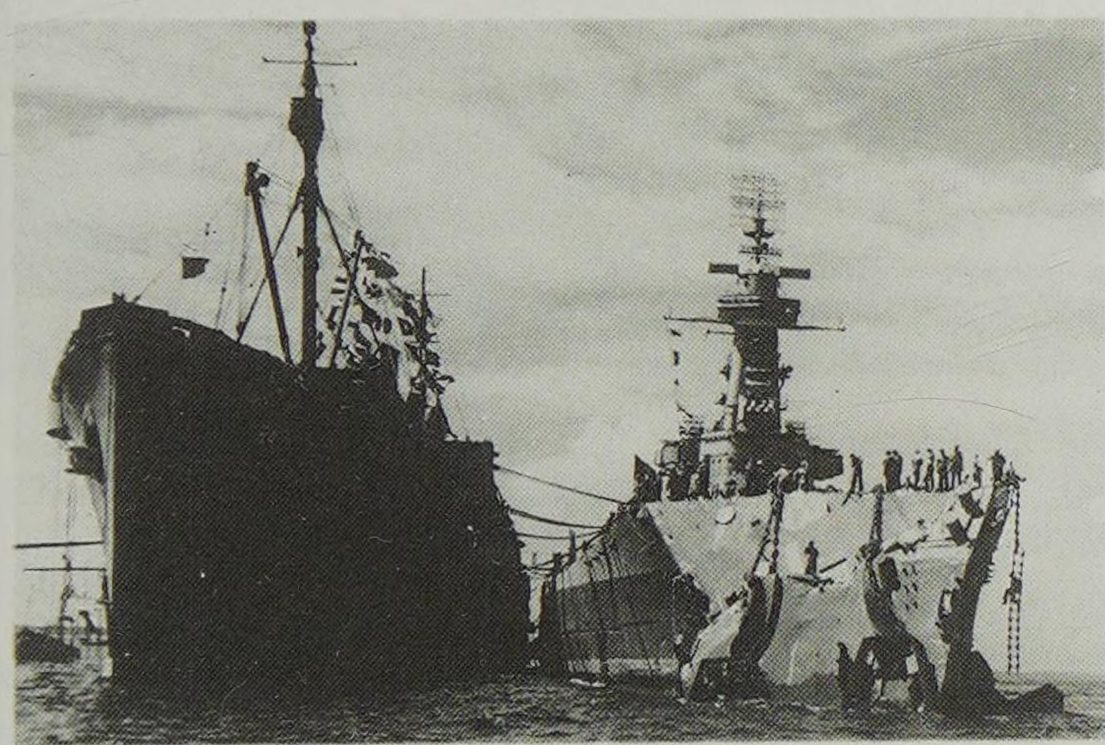
Circa Apr 1941 PhNSY. BB56 during the builder's trials period which take place prior to commissioning. In the background is UK BB HMS Resolution. In addition to the supplies, food, fuel, ships and aircraft the US provided to the UK in WWII. The USN also regularly performed overhauls on UK capital ships both before and after the US entered WWII. One notable example being in May 1941, prior to the US being officially involved in WWII, the UK BB HMS Rodney was enroute to the NyNSY for overhaul when called into action against the German BB Bismarck.

Left: 14 May 1942 Atlantic Ocean. BB56 operating with TF99, in company with the UK BB HMS King George V and the UK CV HMS Victorious under British Tactical control. The UK's KGV class and the BB55 class were contemporary designs. The BB55 however was the superior design, with superior firepower, speed and range. The BB55 class compared well to the German BB Tirpitz. Tirpitz was the primary reason for USN BB operations in the Atlantic 1942-1943. BB56 was operating in support when UK commanders made the decision to abandoned Convoy PQ17 off Norway on 3 Jul 1942.

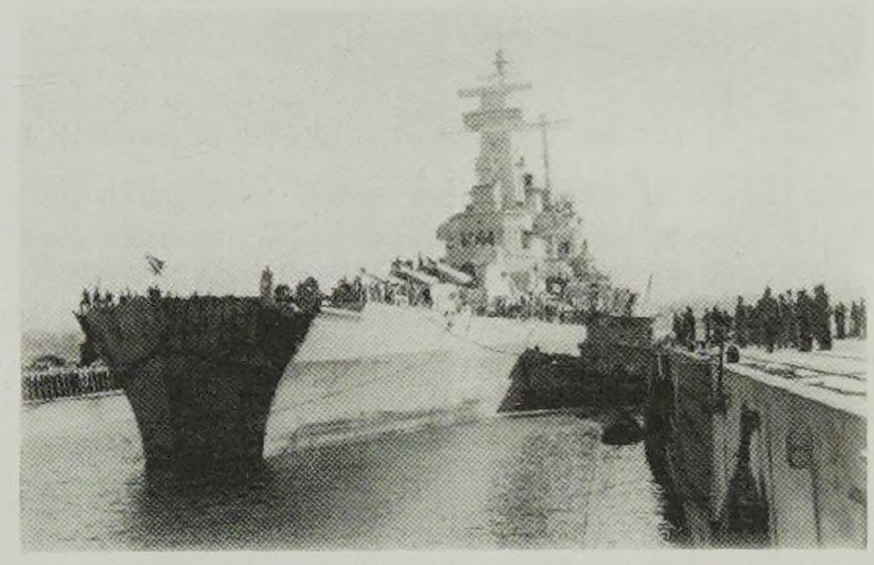
Right: circa May 1942 BB56 as seen from HMS Victorious. Paint is Ms12. Note the Mk3 mod1 radars atop the Mk38 main battery directors, and the minimal medium and light AA batteries. It was originally intended to have both BB55 and BB56 assigned to the UK's Home Fleet, but BB55 remained at NYNSY to undergo testing and evaluation to resolve the BB55 classes high speed vibration issues. dbc



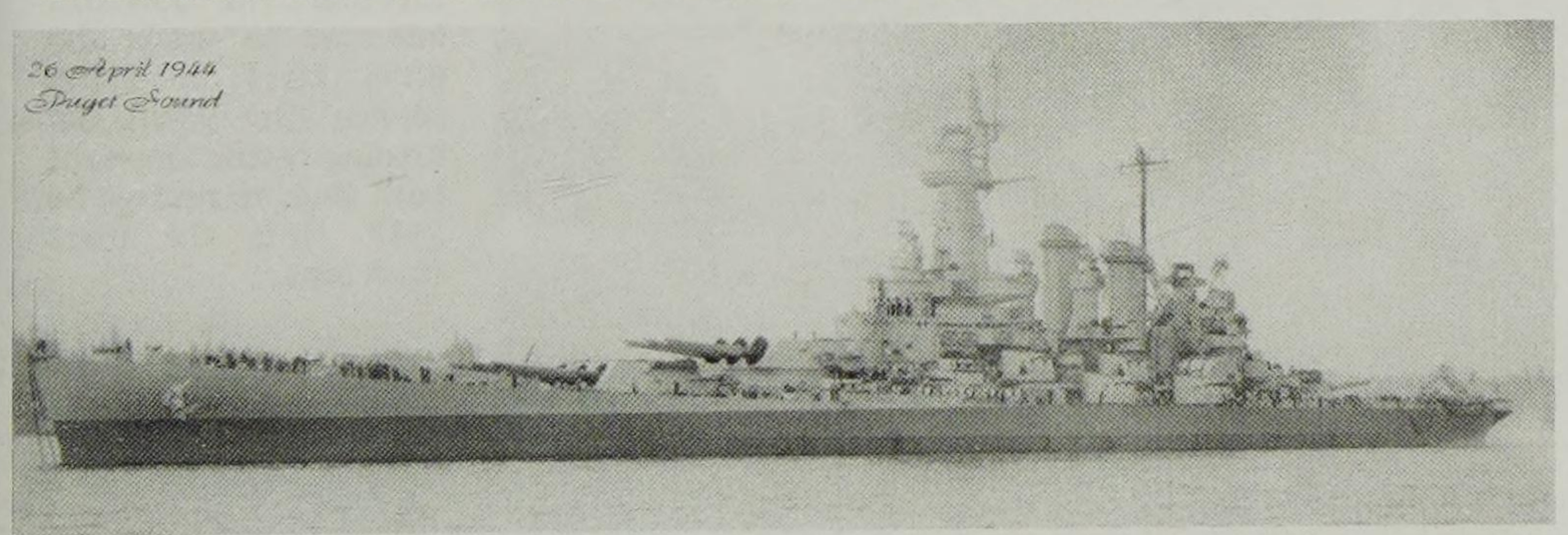
"Night Action" USS Washington BB56 New Georgia Sound Solomons Islands 15 Nov 1942. 4th Battle of Guadalcanal against the Japanese battleship Kirishima off Savo Island. In the left distance behind Washington, Kirishima can be seen surrounded by 16" shell splashes, and burning furiously. Washington has been able to close the range to 6000 yards undetected, whilst Kirishima's attention had been concentrated on engaging the disabled, and electronically blinded battleship South Dakota BB57. Opening fire at 'point blank range' Washington with 19 hits quickly reduced Kirishima to a burning sinking wreck that was left to be scuttled before dawn on 15 Nov 1942 by her own crew. Washington's action was the only USN 3rd generation battleship to Japanese battleship engagement to take place in the Pacific Theater during WWII.



Right: 13 Mar 1944 Drydock 5 Puget Sound NSY BB 56 with temporary bow. A prefab bow was attached and BB56 was repaired by 26 Apr 1944.

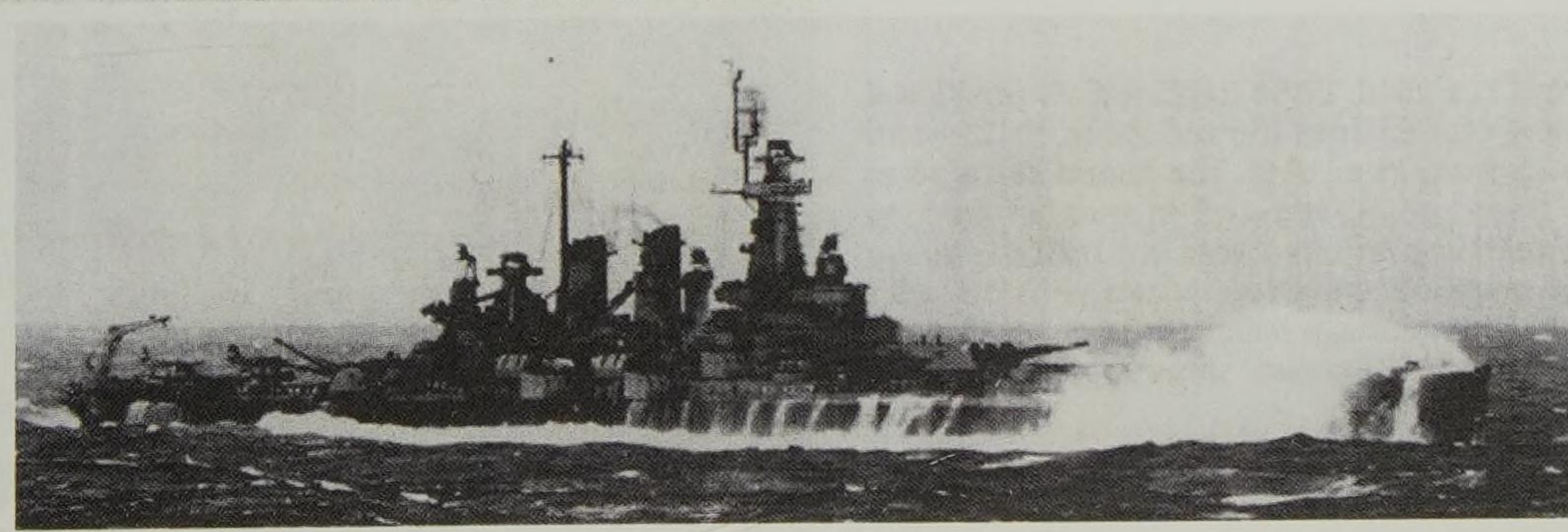


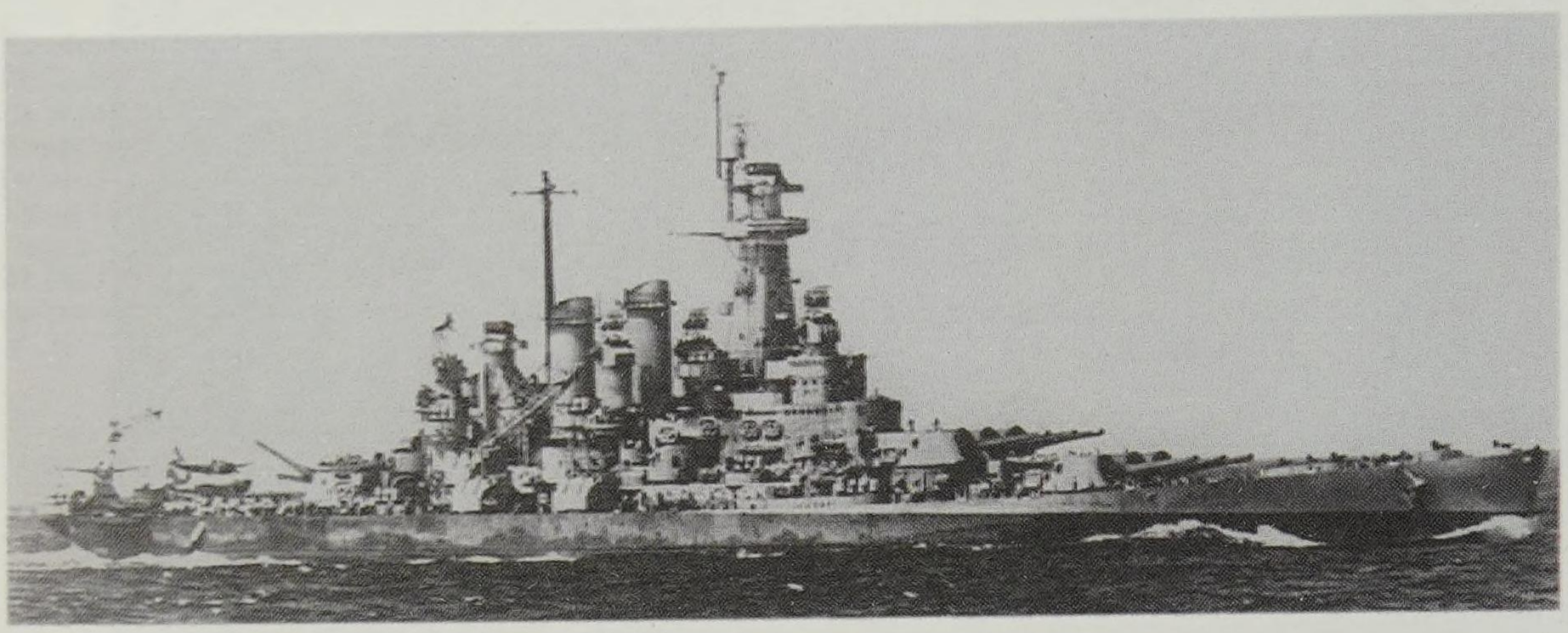
Left: 2 Feb 1944 Majuro Lagoon. BB56 after colliding with BB58 off Kwajalein 1 Feb 1944. Alongside is the Repair Ship USS Vestal AR4.



Left: 9 Apr 1944 Juan de Fuca Straits Puget Sound.BB56 after repair and overhaul of damage which resulted from the collision with BB58. This is BB56's final wartime appearance. Note the forward slope of the demarcation color break line on the Ms22 camouflage.

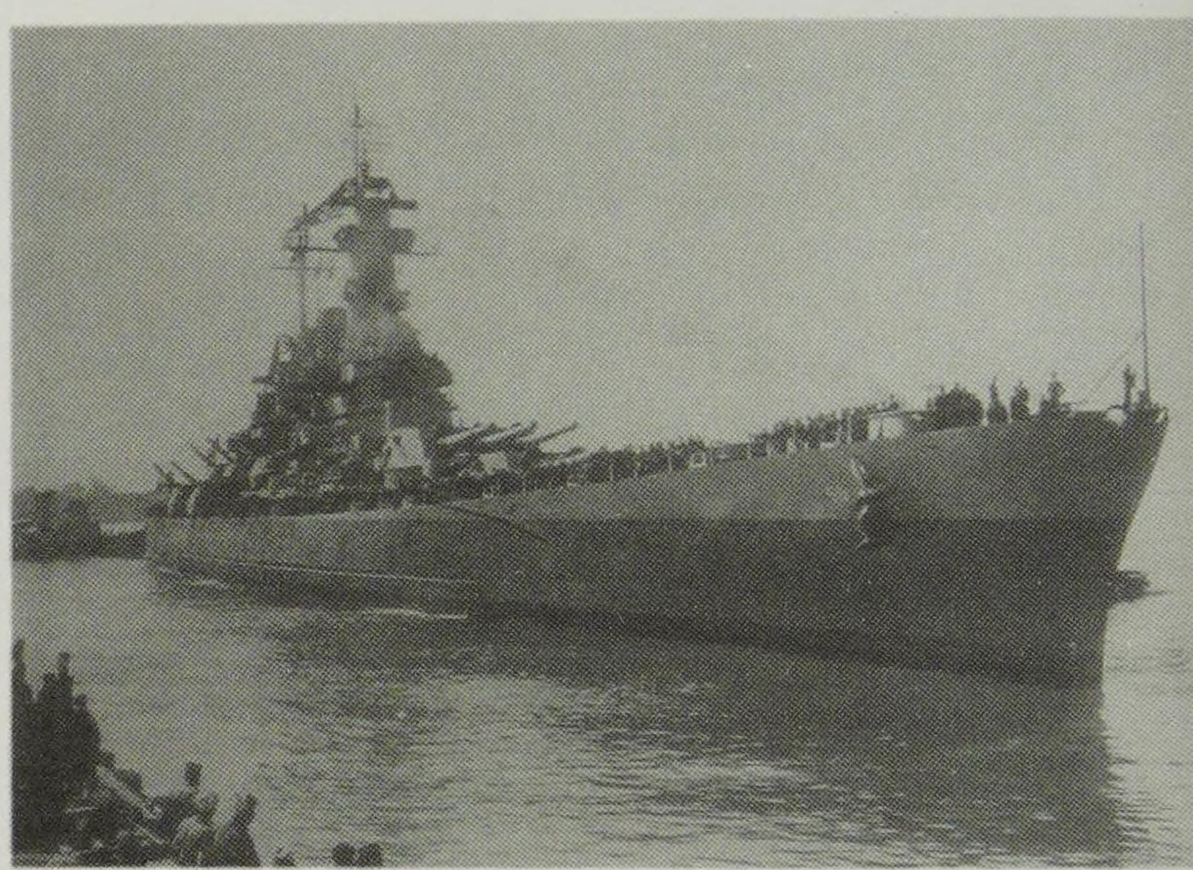
Right: Late 1944 Unknown location. BB56 operating in heavy seas. BB's due to their low silhouettes took 'Green Water' over the bow and on the weatherdecks much more readily than did high freeboard CV designs.



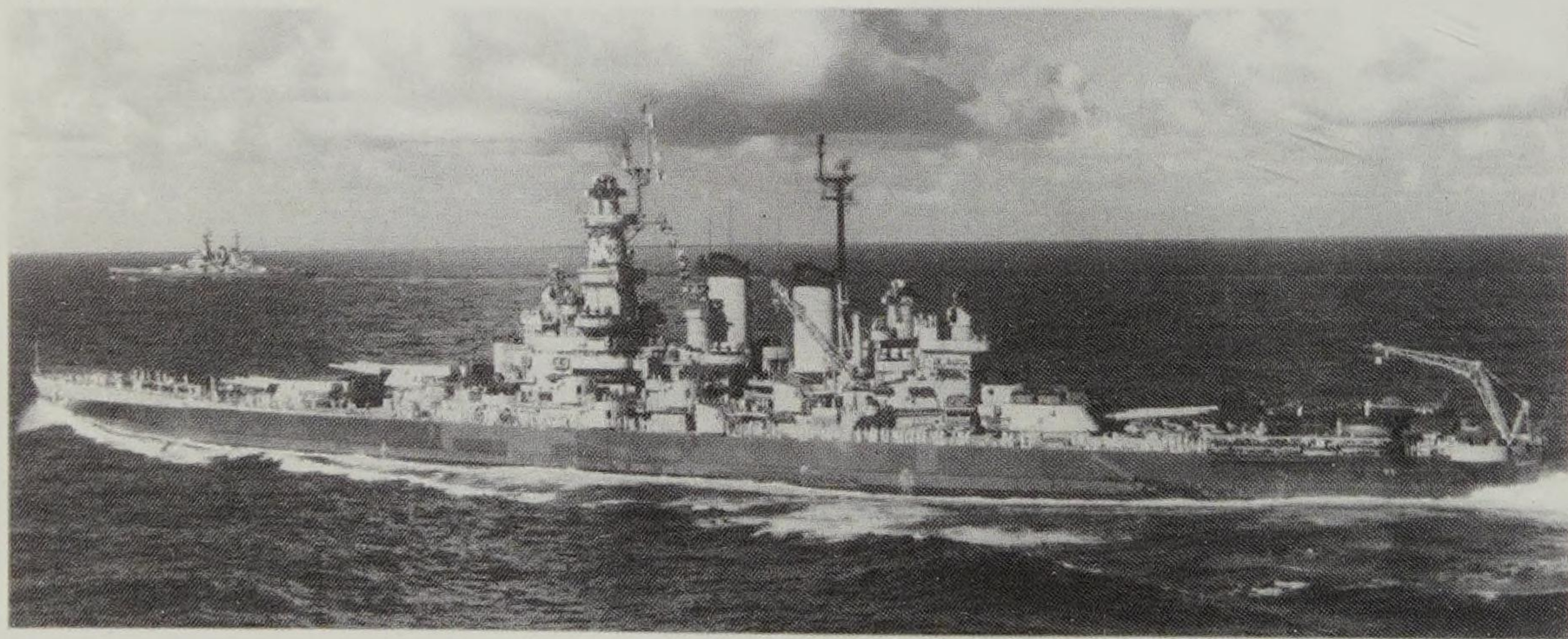


Right: Circa Apr 1945 Unknown location. BB56 wearing a faded and worn Ms22. Note the extension to the after Mk4 DP Fire Control radar added to help alleviate RF inference issues with the aft Mk8 Main Battery director's radar. BB56 did not receive the platform deck halfway up the fire control tower as did BB55. Note the forward slope on the Ms22 color demarcation line unique to BB56.

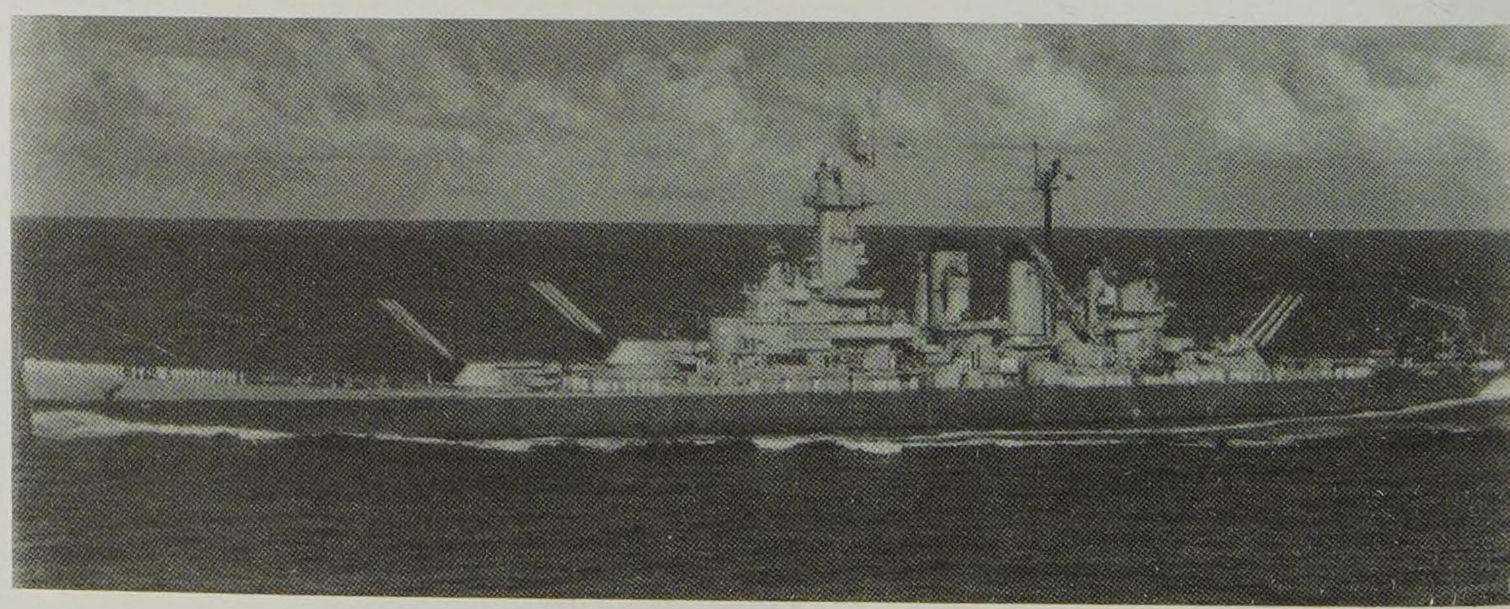
Above: Apr 1945 off Okinawa. After completion of fueling BB56 accelerates away from the Fleet Oiler USS Kaskaskia A0 27.



Right: 17 Oct 1945 Philadelphia NSY. BB56 arriving for Navy Day Celebrations. AP photo. dbc



Left: Circa 1946 off the East Coast of the US. BB55 foreground and BB56 background steam together. The USN had intended to retain the BB55 class in active service after WWII. But funding restrictions sent both ships to reserve by 1947. Note the black stack caps.



Right: Circa 1946. BB56 deployed on postwar a training cruise. Note the reduction to 11 quad mounts from 15 in 1945. The 20mm battery has also been greatly reduced in number to help ease manning requirements in a postwar active duty qualified crewmen shortage. USN BB's retained camouflage paint (Ms21 or Ms22) until 1947 when all active ships were repainted Ms13.

South Dakota Class: 4 Battleships of 1938:

USS South Dakota BB 57 USS Indiana BB 58 USS Massachusetts BB 59 USS Alabama BB 60

The South Dakota class design was the result of an extensive and rapid redesign process to produce a satisfactory 16"/45 armed battleship that had adequate 16"/45 gunfire protection within the 35,000 ton displacement constraints of the Washington Naval Treaty. The only practical, and the most expedient way to obtain the increased in the armor thickness was to shorten the length of the ship's hull by 50' from 729' to 680' wl. Which thereby shorten the length of the armored citadel enabling it's overall thickness to be increased. However, due to the overall internal hull volume also being deceased, reductions had to be made in other areas, this was accomplished primarily by a reduction of habitability space. Foreshorting the hull also meant a shorter "Length to Beam Ratio" resulting in a decrease in speed for a given power rating. This required a 25% increase in the SHP output of the engineering plant to maintain the required 28knt battlefleet speed. The shortening of the Length to Beam Ratio also resulted in highly maneuverable ships which with an increase in freeboard resulted in very good seaboats.

The redesign specified a main battery of nine gun 16" /45 Mk6's in 3 triple turrets, with a secondary armament in BB58-BB60 of 20 5"/38 DP's in 10 twin mounts with 4 sited on the 02 deck level, and 6 atop the second deckhouse (03 level) level. BB57 mounted only 4 twin 5"/38's on the 03 level, as the magazine spaces for the other two mounts were used for flag facilities, as BB57 was fitted as the Battleforce Flagship. BB57 also featured an additional level in the conning tower for accommodation of the Battleforce Commander's Staff. A 'pyramid style' superstructure was designed around a large forward fire control tower. A single large stack topped with a raked stackcap was flared into the aft portion of the forward fire control tower. Aft of the stack was a medium height after main battery fire control tower. A long sweeping single level maindeck, clean hull with no portholes, and a inboard recess over the internal main side armor belt that ran from main turret 1 to turret 3, with a catwalk at the main deck level amidships abaft the deckhouse. A slightly raked, bulbous and outwardly flared bow design was incorporated.

As completed the ships were armed with what by later wartime standards to be a small number and inadequate calibers of medium/light AA armament, which was progressively upgraded during refits. As these ships were of a modern design they received minimal modifications during WWII, primarily consisting up the upgrading of radar systems, rearrangement of the masts, and augmentation of the medium/light AA batteries.

After WWII ended the BB57 class ships were scheduled for ready reserve status (with partial manning and deployed regularly for training operations). BB59 and BB60, which were undergoing overhaul at the end of WWII had their light AA battery reduced. However, due to funding levels the BB57 class ships were placed into inactive reserve by 1947.

As with the preceding BB55 class further BB57class usage studies were conducted in the 1950's, Projects such as 33knt BB rebuilds, AOE's and LPH's. But no conversions were authorized.

The BB57 class were considered superior to foreign contemporary designs, and while they were overweight, as completed (over 41,000 tons). The BB57 class were considered to be the best of the 35,000 ton treaty ships.

BB57 and BB58 were stricken from the Naval Register in Jun 1962 and sold for scrap. BB59 was also removed from the Naval Register in Jun 1962. In 1965 BB59 was loaned to the state of Massachusetts for service as a museum ship. BB59 was moved to Fall River MA in 1965. BB60 was also deleted from the Naval Register in Jun 1962 and loaned to the state of Alabama. In 1963 the ship was towed to Mobile AL, and has served as a museum ship since Sep 1964.

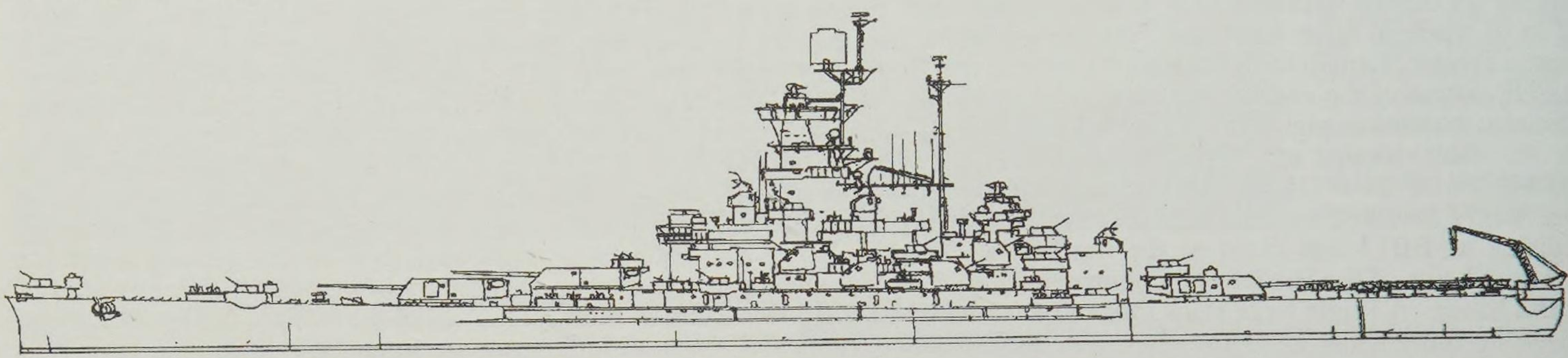
South Dakota Class Statistics

Displacement	Std as Design/Actual		35,412 tons/41,500 tons
	Full Load		44,782 tons
Dimensions	Length WL/OA/Beam		666'0"/680'0"/108'2"
	Draught (max)		35' 3/4"
Machinery	Type		4/Geared Turbines
	Boilers		8 (oil fired) 570psi 850F
	Shafts/designed SHP		4 shafts/130,000 shp nominal
	Rudder		twin
	Max Designed Speed		27.5 knts
	Weight of Eng Plnt		3,236.3
	Fuel bunkerage/Range		5,011.7tons/15,02 nm@15.0kns
	Tactical Diameter		733 @ 26.5kns
	GM		8.94
Armament	Weight of Broadside		24,300Lbs/12.5tons
	Projectile Weight		2,700lbs/1.35tons
	Max range		36,900yds/20.9miles
	Rnds/Weight per Min		2.0/25tons
	Rnds per gun/ Total Rnds		130/1170
	Main		9-16"/45
	Sec		20-5"/38 BB58-BB60
			16-5"/38 BB57
	AA	1945 BB58-60	56-40mm 54-20mm
		1945 BB57	60-40mm 51-20mm
		1946 BB59 BB60	44-40mm 12 20mm
Protection	Main Belt/Incline		12.2" +1.5"/19 °
	Deck (total)		8.3" /3 decks
	Turret		18.0 face 9.5" side 12" top 10" back
	Total Armor Weight		8,198.0 tons
Catapults/Aircraft	2 Cats/3 Aircraft		

Battleship USS South Dakota BB57 Call Letters: **NEBC**

Builders Yard		New York Shipbuilding Camden NJ	
Reserve Group		Philadelphia PA	
Scrapping Yard		Lipsett Co Kearny NJ	
Ordered	Keel Laid	Launched	1st Comm
15 Dec 1938	5 Jul 1939	7 Jun 1941	20 Mar 1942
Decom	Stricken	Sold	Scrapped
27 Jan 1947	1 Jun 1962	25 Oct 1962	Nov 1962

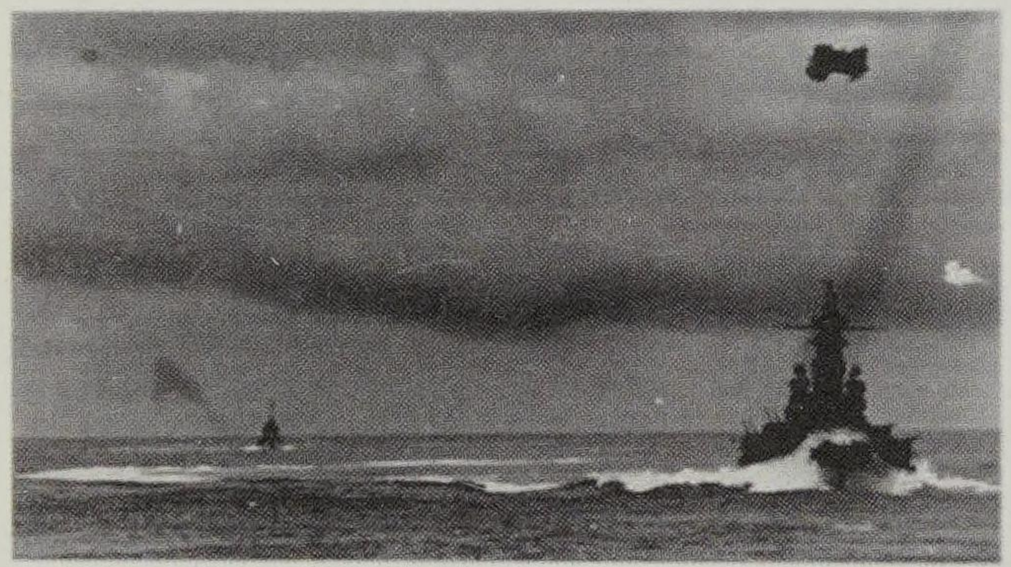
Active Service Years: 4.9



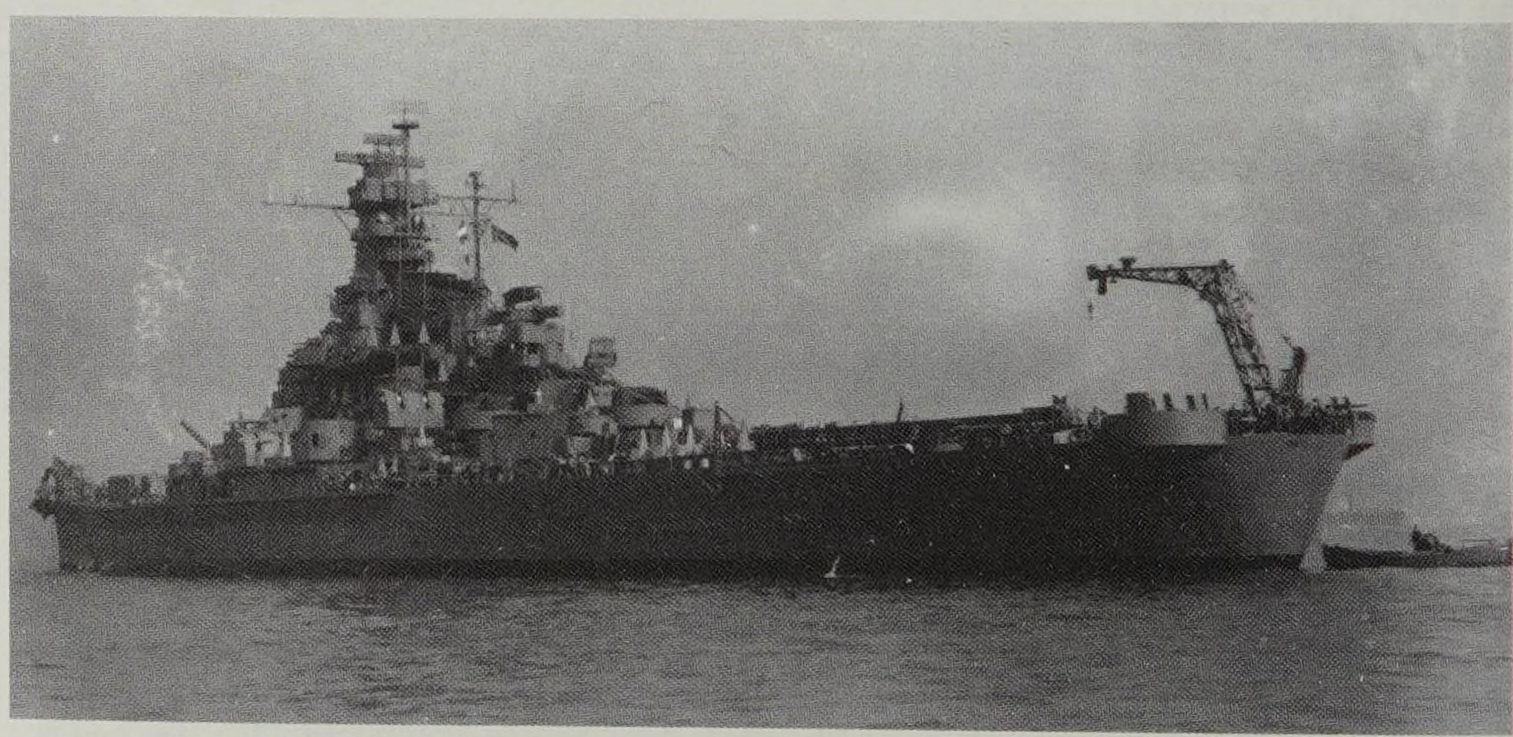
USS South Dakota BB57 Aug 1943 Ms2

Left: 4 Jun 1942. PhNSY. BB57 departing for shakedown cruise. Note the minimal medium/ light AA battery of 1.1" and .50cal MG's. These were replaced with new longer range (6 miles for 40mm vs. 4 miles for 1.1") 40mm's and 20mm's prior to the Battle of Santa Cruz. These new guns contributed heavily to BB57 destroying 26 Japanese aircraft during the battle. Which is the record for a single action by a USN BB.

Below: Circa Jun 1943 North Atlantic. BB57 operating with UK BB HMS Duke of York. The ship is exercising with obsolete British Swordfish torpedo planes. Note the Mk3mod0 radars on the Mk38 directors. SC2 radar forward and SG set aft.

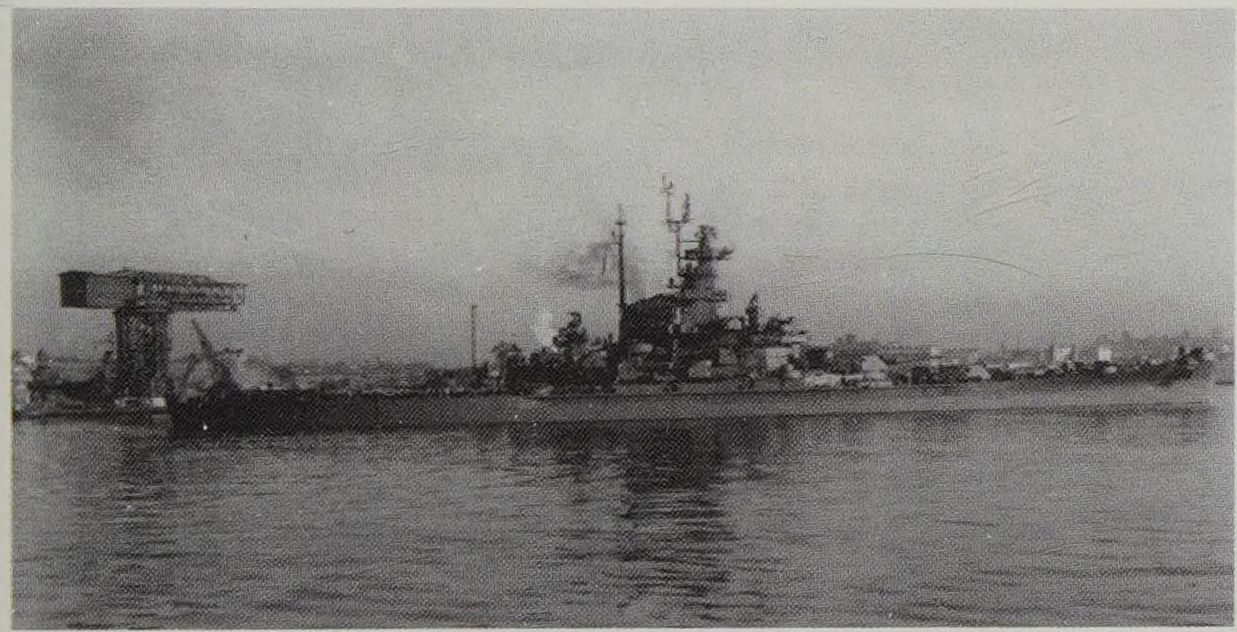


Above: 26 Oct 1942 The battle of Santa Cruz. BB57's AA defense of the aircraft carrier USS Enterprise CV6 during this action undoubtedly saved the CV6 from being sunk. If CV6 had been lost in this action that would have left the USN with no operation carriers in Pacific until the return of the submarine torpedo damaged USS Saratoga CV3 in Dec 1942. With no operational CV's during this period the USN could conceivable have been decisively defeated by Japan. This action unequivocally demonstrated the significance of having the AA protection of the fast BB's within the CV Task Forces.



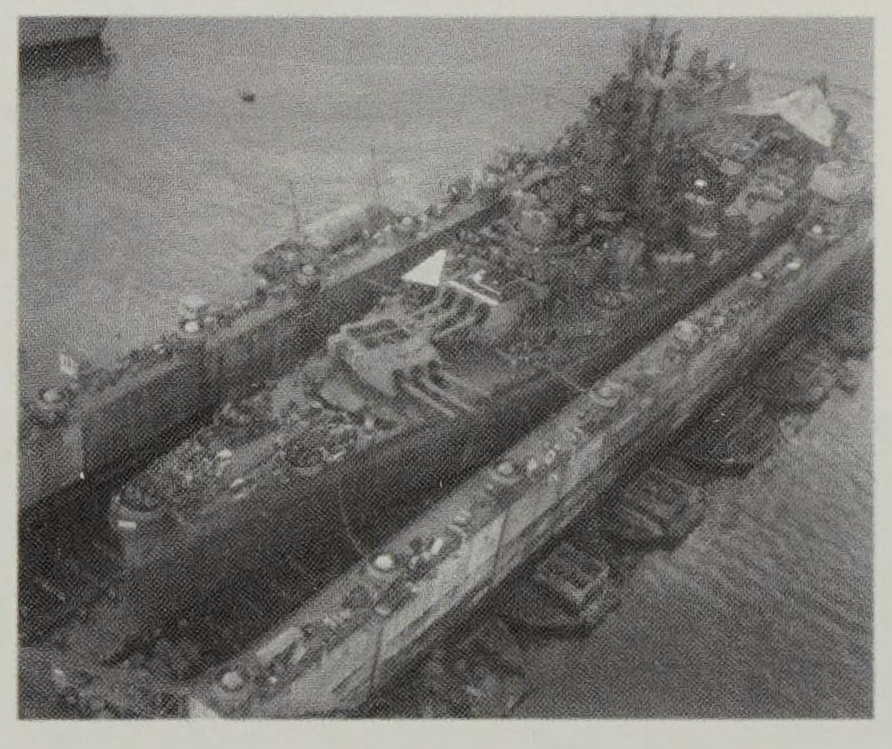
Above: Feb 1943 NyNSY. BB57 underway on post overhaul shakedown. Note the bow and forecastle 40mm arrangement unique to BB57. Note also the retention of the Mk3mod0 radars for main battery fire control, and the SC2 set atop the mainmast. Paint is Ms14.

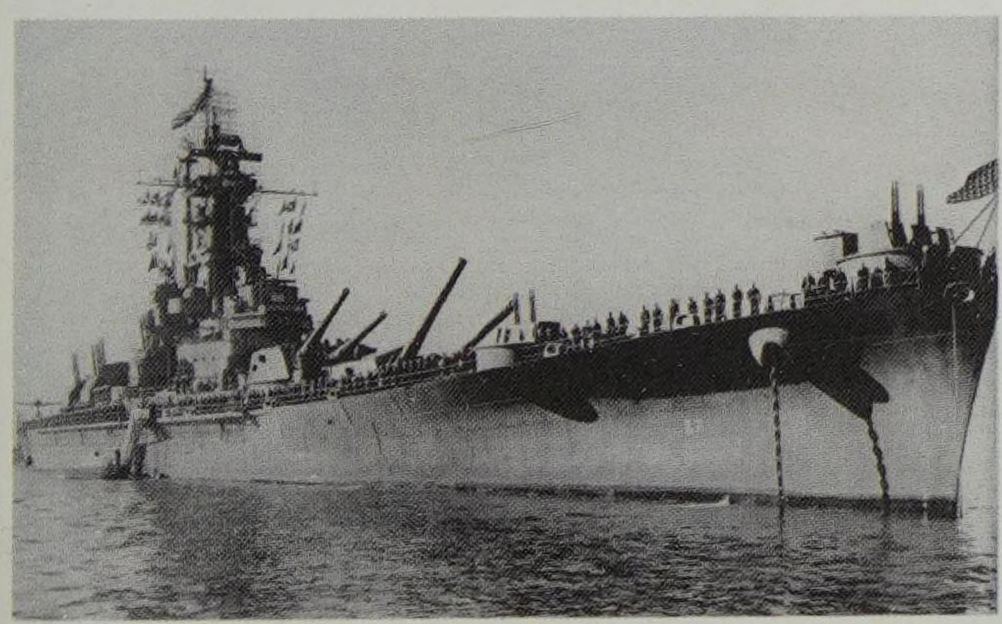
"Battleship X" USS South Dakota BB57 off Santa Cruz Island, Solomons Archipelago, 6 Oct 1942. Escorting the USS Enterprise CV6 during the Battle of Santa Cruz. During the battle BB57's AA batteries were able to repel the Japanese aircraft committed to sinking Enterprise. BB57's new quad 40mm mounts with improved range, and increased striking power succeeded in destroying 26 Japanese Aircraft during the battle, thus saving the Enterprise, which at the time was the USN's last operational aircraft carrier, from almost certain destruction. The USS Enterprise was able to 'hold the line' in the Pacific until the arrival of the new Essex class carriers in early 1943. South Dakota was the lead ship of a new redesigned class of battleship which first became operational in late 1942. At the time the BB57 class was considered a classified design, and as such BB57was referred to as 'Battleship X' for security reasons in official USN press releases thru 1943.



Above: 21 Aug 1944 Puget Sound NSY. BB57 underway after completion of overhaul. Note the bow 40mm and lack of the 5th center 5"/38 DP twin mount both unique features to BB57. The mainmast has now been relocated to the after part of the stack. Note the SK on foremast and SP on the mainmast. Paint is Ms21.

Below: 11 May 1945 ABSD6 Apra Harbor Guam. BB57 after a powder explosion (5 canisters) in 16" magazine No2 on 6 May 1945.





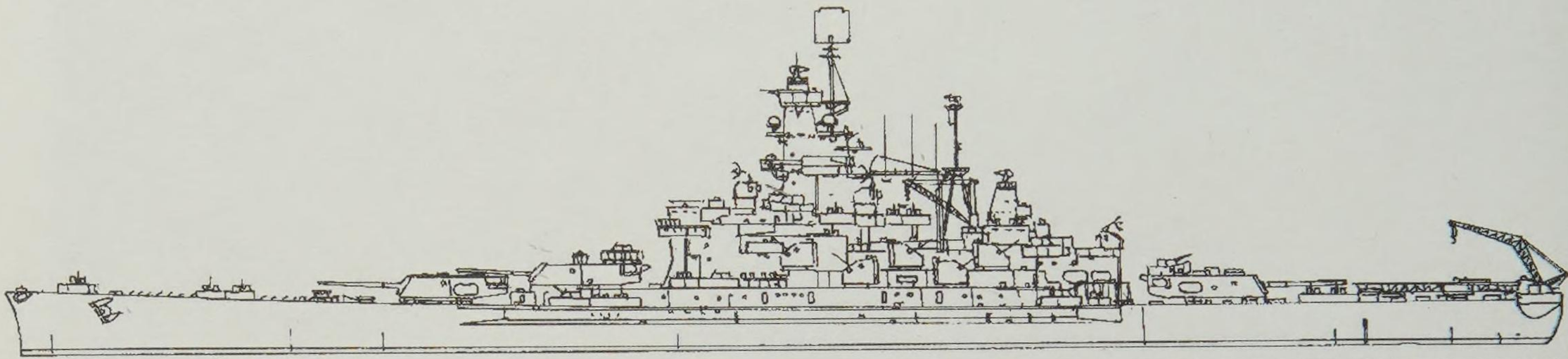
Left: 22 Nov 1945 San Pedro Harbor. BB57 during Admiral Halsey's 3rd Fleet Change of Command Ceremony. As the 3rd Fleet Flagship BB57 returned Admiral Halsey to San Francisco on 15 Oct 1945. Where BB57 participated in the 27 Oct 1945 Navy Day celebrations.

Right: 20 Jan 1946. PhNSY. BB57 arriving to start the deactivacation process. Note the hull paint rime ice stains.

Battleship USS Indiana BB58 Call Letters: **NENS**

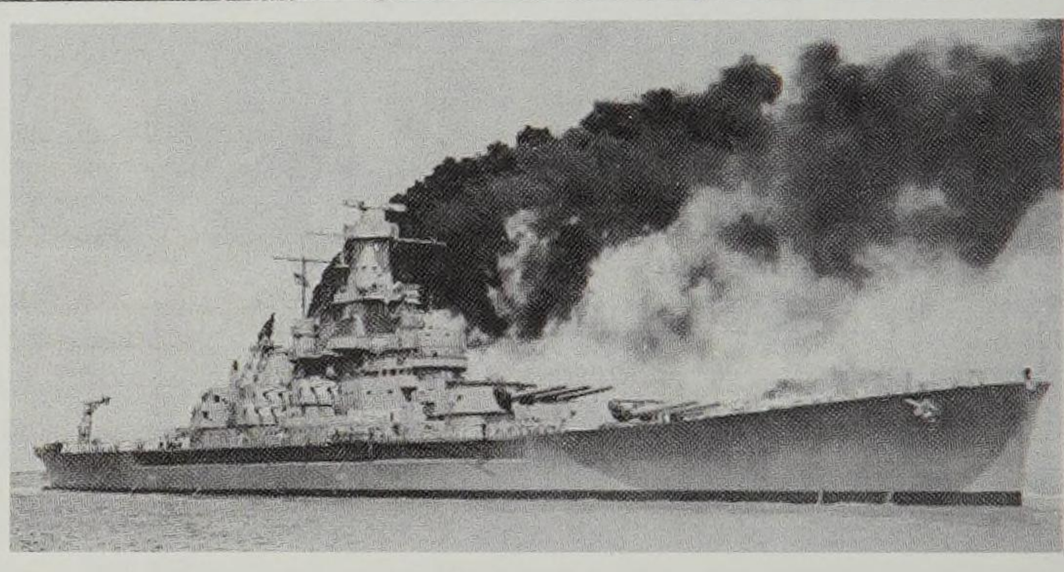
Builders Yard	Newport News Shipbuilding Co Norfolk VA		
Reserve Group	Bremerton WA		
Scrapping Yard	Nicolai Joffe Corp Richmond CA		
Ordered	Keel Laid	Launched	1st Comm
15 Dec 1938	20 Nov 1939	21 Nov 1941	30 Apr 1942
Decom	Stricken	Sold	Scrapped
11 Sep 1946	1 Jun 1962	6 Sep 1963	Nov1963

Active Service Years: 5.4



USS Indiana BB58 Feb 1942 MS15

Right: Circa: May 1942 Norfolk Harbor. BB58 as completed. Note the 40mm, 20mm battery and that the search and fire control radars have yet to be installed (except for the forward Mk37 which has a Mk4 installed). The great quantity of black smoke is the result of "blowing tubes" cleaning the flues of the boilers with compressed air to remove accumulated soot. Until the late 1960's, USN ships routinely "blew tubes" upon entering or leaving port, or every morning when in port. USN ships did not "blow tubes" at sea during WWII to avoid providing a smoke plume to reveal their presence. The ship is wearing "as commissioned" Ms14. Newport News SBCo photo.

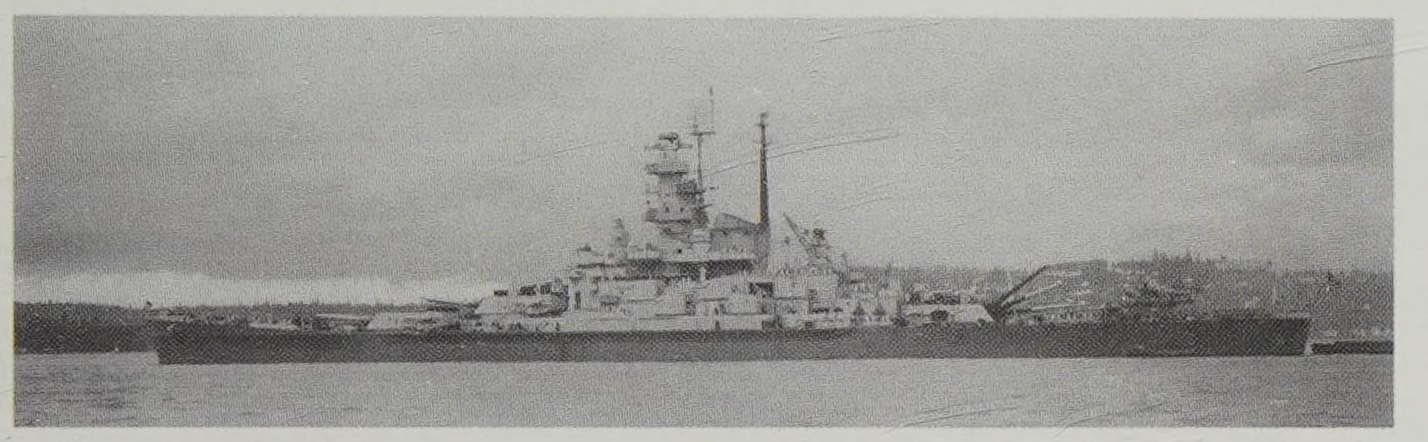


Left: 8 Sep 1942 Hampton Roads VA. BB58 is wearing a relatively rare example of a Measure 15 Disruptive Camouflage Pattern comprised of Navy Blue, Ocean Gray, and Haze Gray. The Ms15 Camouflage Pattern is nearly identical on both sides of the ship. Note the 40mm and the 20mm AA battery. BB58 was the first USN BB to complete with them installed. The mainmast is mounted atop of a short tripod mast. Note single SG radar on the foremast.

Left: USS Indiana BB58 off the Virginia Capes May 1942. As seen from the signal bridge of an accompanying Heavy Cruiser. The newly commissioned Indiana is accelerating into position abeam of the Cruiser. Overhead a Curtiss SOC3 Seagull catapult floatplane from the Cruiser has been providing a target for AA training drills. During 'live fire' AA training exercises an aircraft tug would pull a target sleeve ¼ mile behind them. During surface gunnery 'live fire' exercises a Fleet Tug (ATF) would tow a barge with a wooden slat vertically target mounted.

Left: December 1943 South Pacific. BB58 operating in support of the Fast Carrier Striking Force. TF38 is enroute to provide cover for the landings on the Gilbert Islands. By late 1943 the tempo of the American advance across the Pacific began to quicken, and gained momentum daily as more powerful new ships like BB58 join the fleet. Paint is Ms32/11d. BB58 was the only BB57 class ship to wear camouflage patterns both a Ms15 and Ms32.

Right: Feb 1944. Majuro Lagoon. BB58 after colliding on 1 Feb 1944 with BB56 during night maneuvering to fuel destroyers off Kwajalein. In the background is the USS Washington BB56 and Repair Ship USS Vestal AR4. BB56 damaged 60' of bow when she rammed BB58 on the starboard aft quarter dishing in approximately 100' of hull. Both ships were out of action 7 months. Operational casualties such as this were uncommon in the USN due to the high level of training and seamanship of USN crewmen.



Left: 5 Dec 1944 Puget Sound NSY. BB58 after the completion of overhaul. Note the tall thick mainmast attached to the after section of the stack. All BB57 class ships were so refitted 1944-1945. The ship is painted Ms22. Note the "rippled" rifles on turret 3. USN BB main guns were mounted in individual sleeves enabling them to elevate independently. BB58 retains the stbd crane aft of the stack, the port crane has been replaced with a 20mm gun gallery.

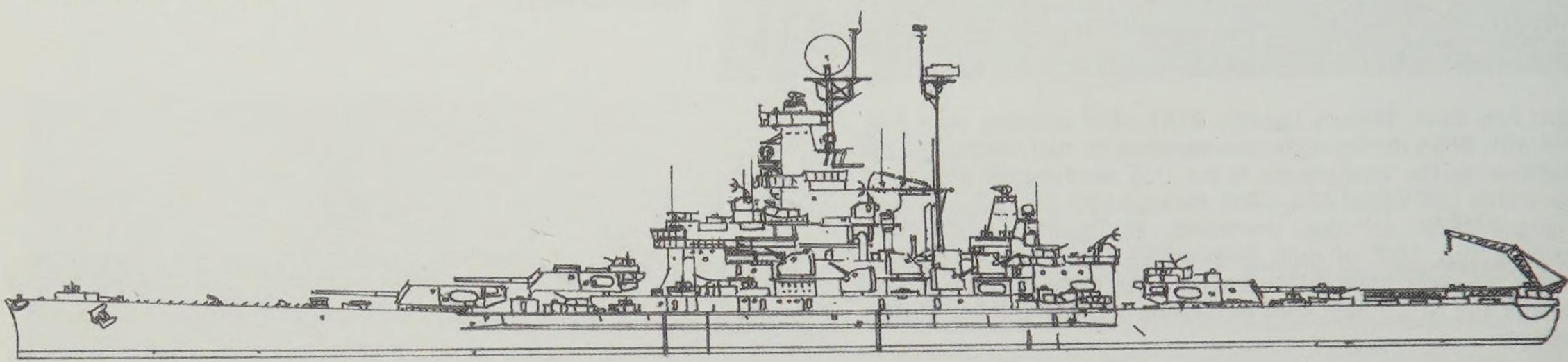
Right: 14 July 1945 off the Nippon Steel Works, at Kamasihi on Honshu Japan. BB58 (foreground), and BB57 close the shore with 2 CA68 class heavy cruisers to conduct a main battery bombardment. By this date the only effective Japanese threat left is from the air. As the Japanese Navy had been virtual annihilated by USN Carrier Task Forces.

Left: Seen under the guns of an accompanying BB the USS Indiana BB58 is at sea with the 3rd Fleet during a rain squall. BB58 operated exclusively in the Pacific Theater after shakedown After WWII BB58 was placed in reserve at Puget Sound NSY and ultimately scrapped at Richmond CA.

Battleship USS Massachusetts BB59 Call Letters: **NEPL**

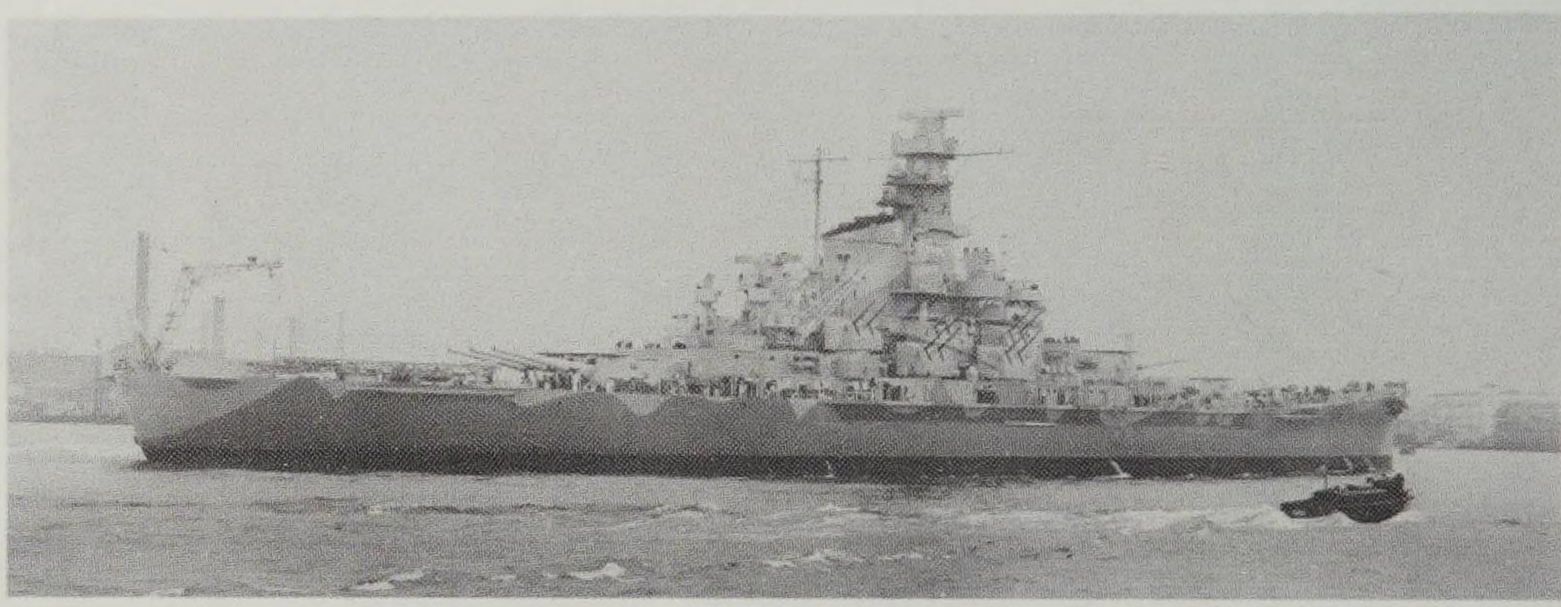
Builders Yard	Bethlehem Steel Quincy MA		
Reserve Group	Norfolk NSY VA		
Scrapping Yard	-		
Museum Location	Fall River MA		
Ordered	Keel Laid	Launched	1st Comm
15 Dec 1938	20 Jul 1939	23 Sep 1941	15 May 1942
Decom	Stricken	Sold	Dedicated
27 March 1947	1 Jun 1962	8 Jun 1965	14 Aug 1965

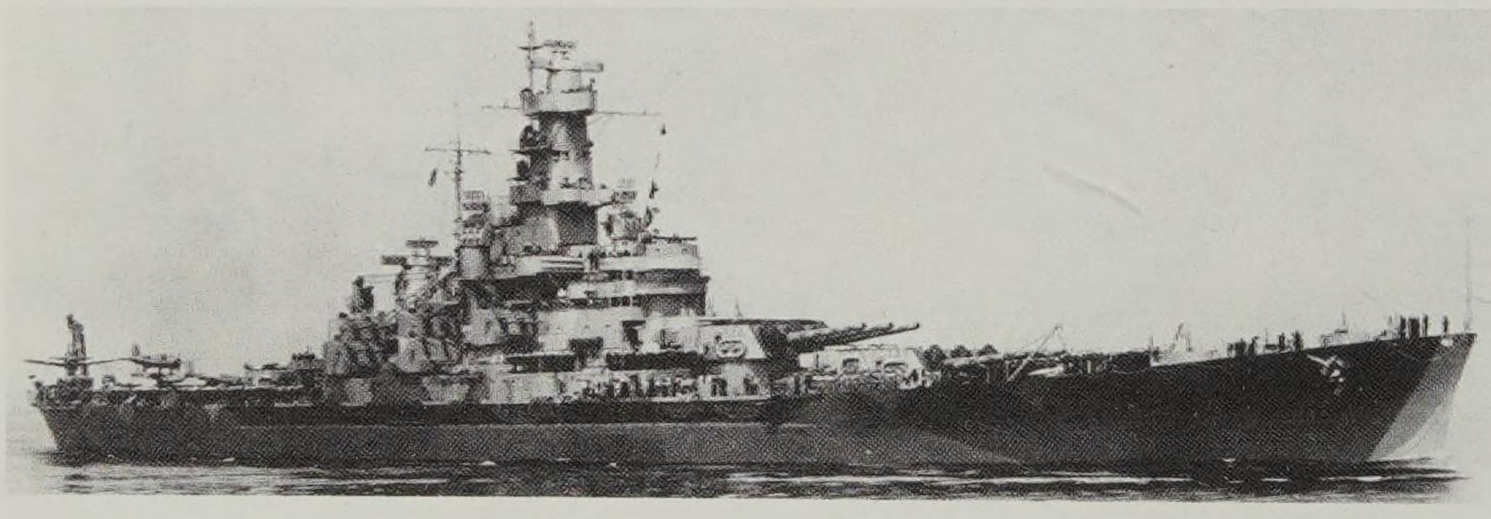
Active Service Years: 4.9



USS Massachusetts BB59 Jan 1946 Ms22

Right: 12 May 1942 Boston Harbor. BB59 underway from the builder's yard at Bethlehem Steel SBCo on the Fore River at Quincy MA to the Boston NSY to be delivered to the Navy. A BB conducted at sea builders trials, on non-weapons systems, prior to commissioning with yard personnel manning the ship. USN personnel took over ship operation at delivery and performed the weapons tests on shakedown. Note the ship is in light displacement with minimal fuel supplies and no ammunition aboard.



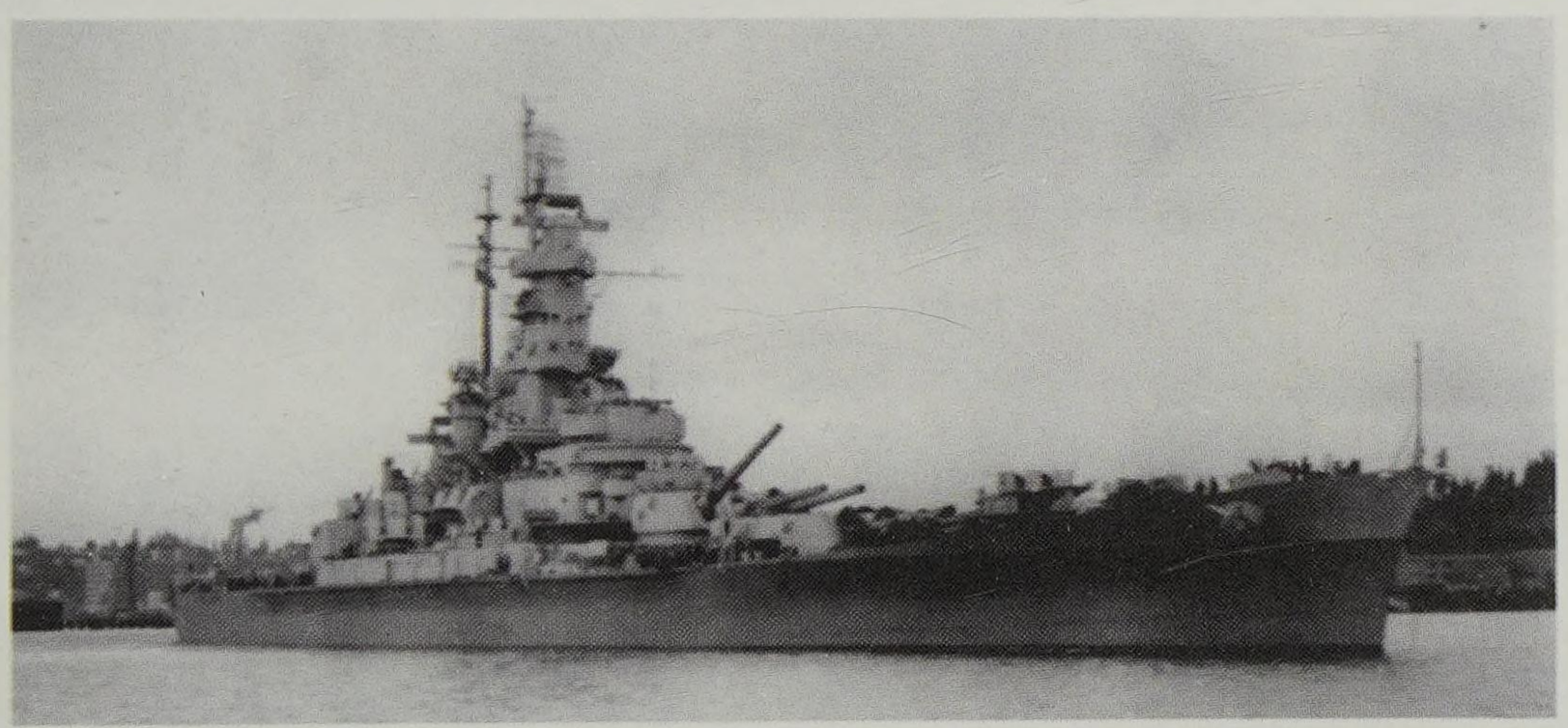


Left: 13 July 1942 Boston NSY. BB59 after shakedown. Note the Mk3mod0 radars atop the Mk38 director BB59 was the last to complete with Mk3's. The only search radar carried at this time is the SG set atop the foremast. The 40mm have not yet been installed. 40mm demand was such that production was barely able to meet requirements and many ships in the 1942 timeframe conducted trials and shakedown without them.

Right: 13 July 1942 Boston NSY. BB59 after completing the ship's post shakedown adjustments and modifications. BB's were routinely drydocked and checked after shakedown cruises to inspect the hull and propulsion systems. Paint is Ms12.

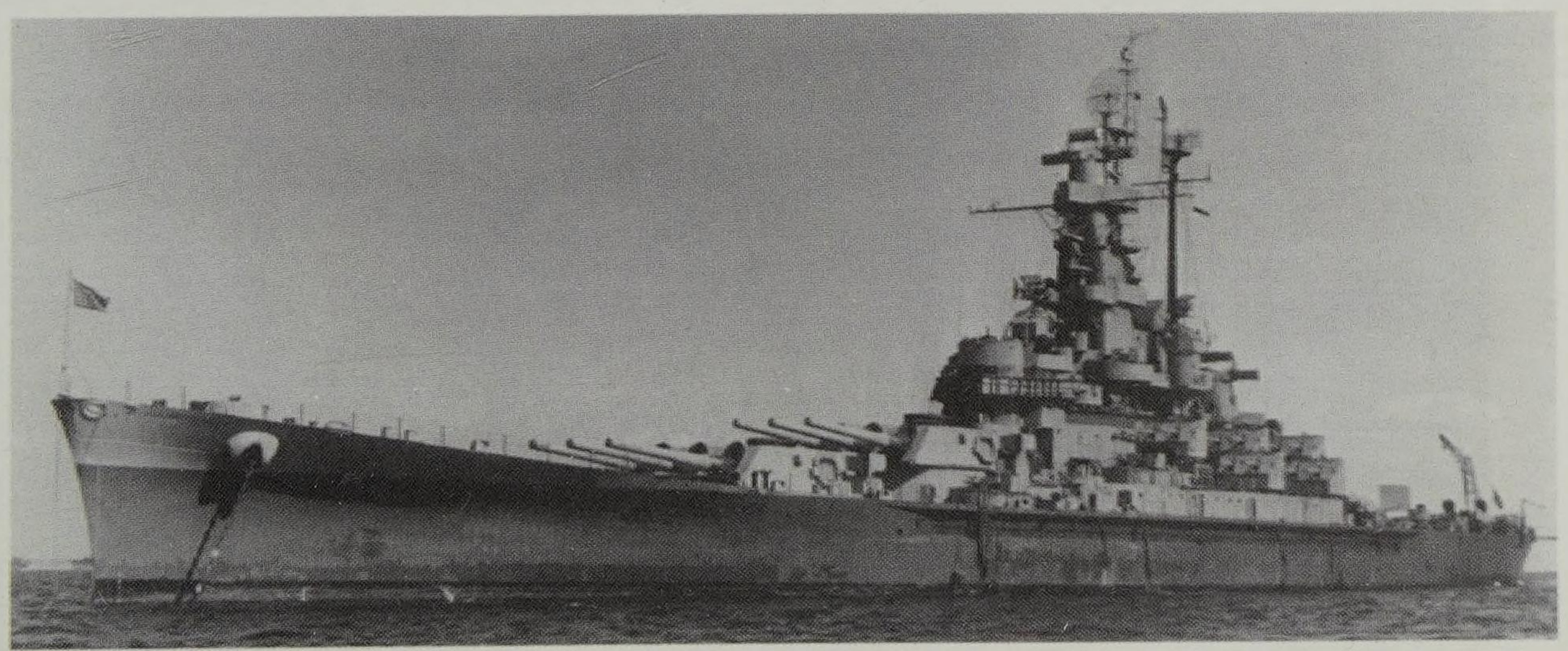
Left: 8 Nov 1942 off Casablanca during Operation Torch, the Allied Landings on North Africa. BB59 maneuvers into position to open fire, the main battery is trained out and ready for action. Note the ship is flying 2 large National Ensigns. The after one was holed by a 15" shell from French BB Jean Bart during the action. The ship is painted Ms22 that BB59 carried for the rest of the ship's active career.

USS Massachusetts BB59 off Casablanca, Algeria North Africa 8 Nov 1942. B59's first combat operation was in support of Operation Torch. The port of Casablanca was controlled by Vichy French forces loyal to the axis, and they engaged the Massachusetts and Task Force as the ships approached the landing beaches with the four operational 15" guns of the immobile unfinished French battleship Jean Bart which had a single operational quadruple turret . In less than 15 minutes the No 1 turret of Jean Bart was jammed in train by glancing hit from one of Massachusetts's 16" shells effectively neutralizing Jean Bart.



14 Sep 1944 Puget Sound NSY. BB59 after completion of overhaul. The BB57 class had short active service lives all being placed in reserve by 1947. The BB57 class ships were never selected for active service in the postwar fleet due to the 28 knot speed limitation and lack of BB operational requirements. Due to persistent postwar intelligence reports of Soviet BB/CB construction programs, and amphibious support requirements. The USN maintained reactivacation plans for the BB55 BB57 class ships until their disposal in the early 1960's.

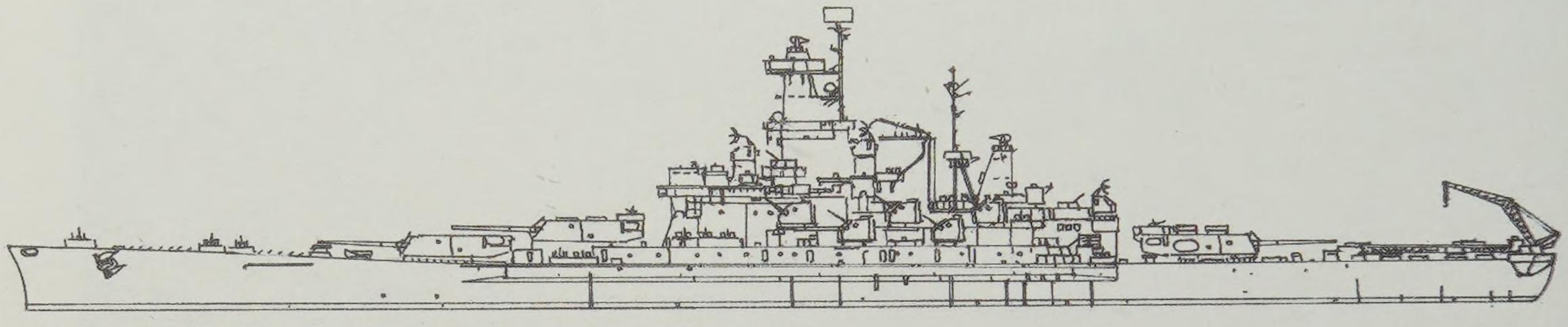
Right: 22 Jan 1946 Puget Sound. BB59 after completion of final overhaul. Note the front of the bridge has been enclosed. The 40mm mounts on the forecastle, and most of the 20mm mounts have been removed. The Mk22 "banana peel" radar attached to the side of the Mk12 radar. Most USN BB's were refitted with Mk12/Mk22 radars from 1944 onwards.



Battleship USS Alabama BB60 Call Letters: **NEMW**

Builders Yard	Norfolk NSY VA		
Reserve Group	Bremerton NSY VA		
Scrapping Yard	-		
Museum Location	Mobile AL		
Ordered	Keel Laid	Launched	1st Comm
1 Apr 1939	1 Feb 1940	16 Feb 1942	16 Aug 1942
Decom	Stricken	Transferred	Dedicated
9 Jan 1947	1 Jun 1962	16 Jun 1964	14 Sep 1964

Active Service Years: 4.4



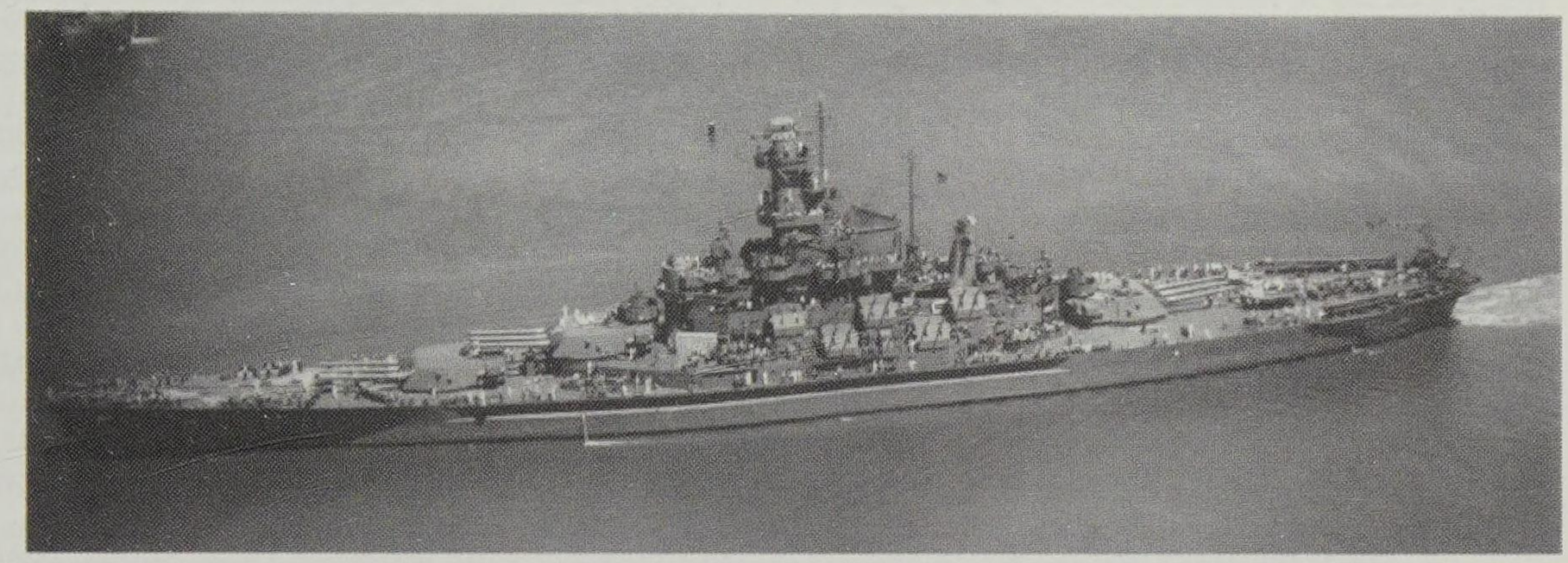
USS Alabama BB60 Dec 1942 Ms12 (modified)

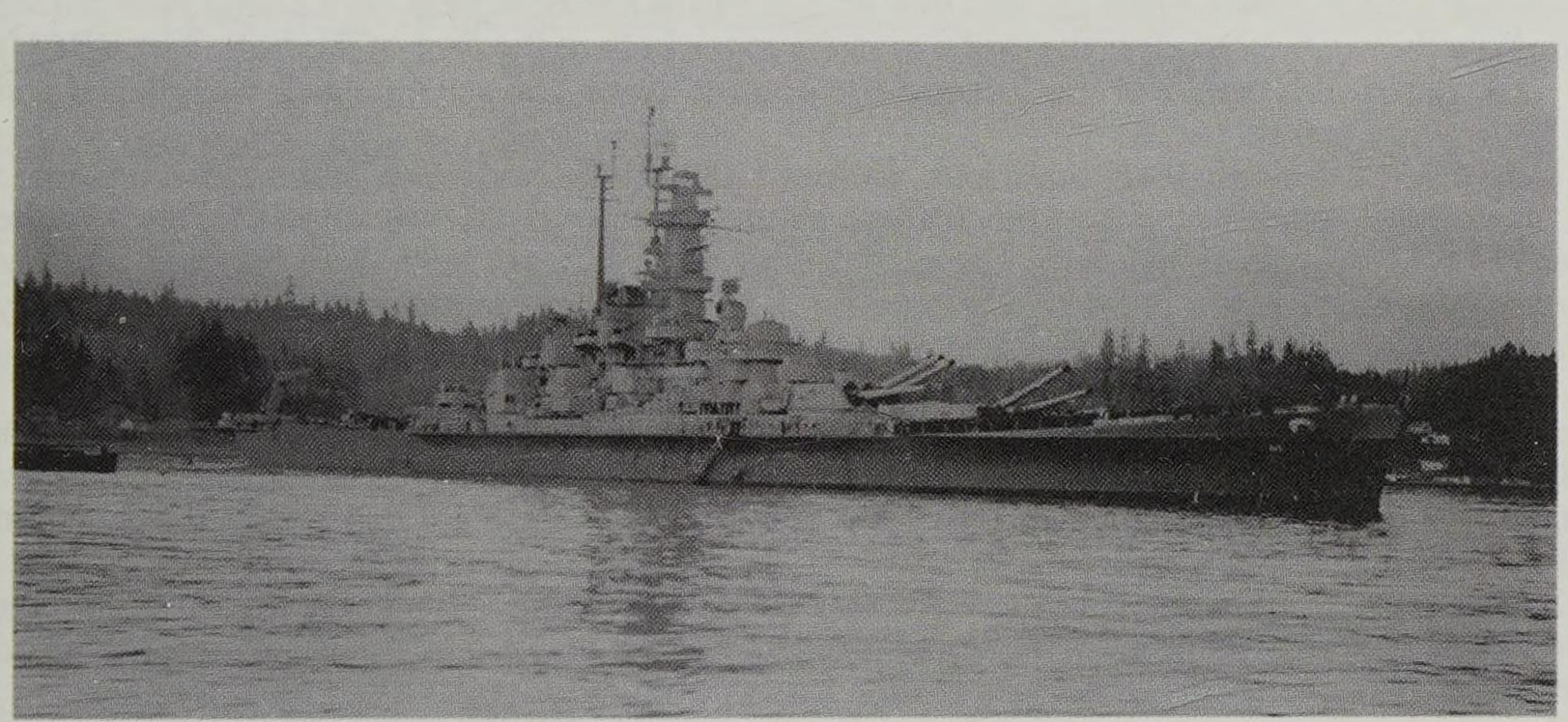
Circa Dec 1942 Casco Bay Maine. BB60 after initial shakedown cruise. Note the lack of radar atop the mainmast and the SC atop the foremast. Paint is Ms12 (modified) the ship was repainted to Ms22 prior to deploying with BB57 for duty with the UK Homefleet in Feb-Aug 1943. Note the relatively high freeboard compared to the preceding BB55 class.

Below: USS Alabama BB60 North Atlantic off Casco Bay ME Feb 1943. BB60 cruising in formation with the also new fleet carrier USS Essex CV9 while operating as TG22.2. While Alabama was deployed to operate with the British Home Fleet out of Scapa Flow, Scotland, BB60 escorted convoys to and from Murmansk USSR. As well as conducting patrol operations with the Home Fleet off the coast of Norway in hopes of bringing the German battleship Tirpitz out of hiding in the fjords, and into battle. Alabama and sister ship South Dakota supported the Home Fleet until July of 1943, after which time both ships transferred to the Pacific. Alabama is painted as commissioned in Ms12 (modified).

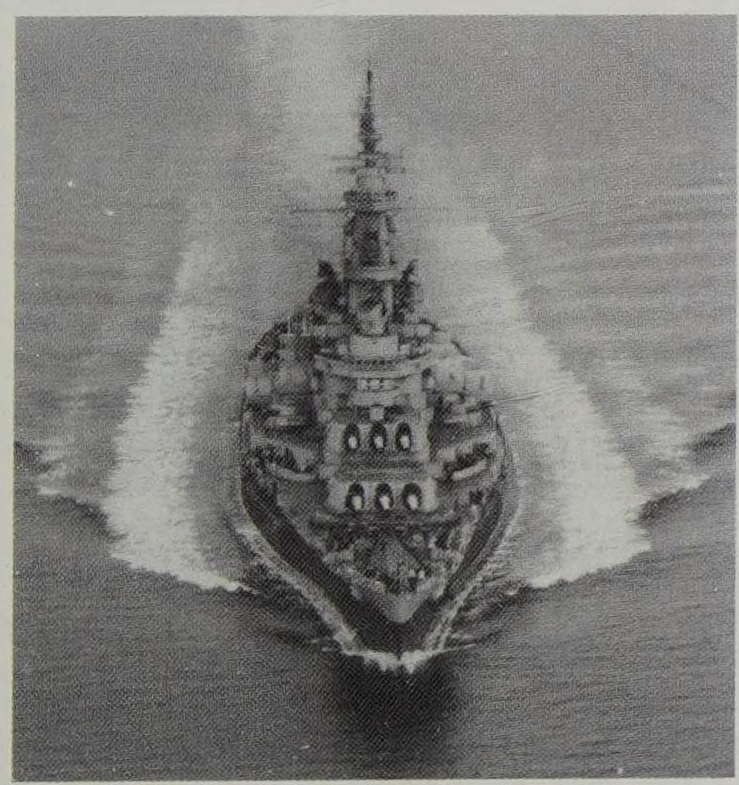
Left: 7 Feb 1943 Norfolk NSY After post shakedown yard period and prior to deploying to the North Atlantic. Note the relatively short overall length of the ship and the compact pyramid type superstructure. Hull numbers were also painted on the stern counters on all USN BB's after early 1942. The ship is painted the Ms22 graded system.

20 Aug 1943 Norfolk NSY. BB60 after completion of overhaul. The ship is returning from conducting post yard shakedown prior to transferring to the Pacific. The ship is now painted Ms21. Note the covers on the Mk8 radars atop the Mk38 main battery directors. BB60 was the first USN BB to compete with Mk8 FC radars installed.





15 Mar 1945 Puget Sound NSY. BB60 post overhaul. BB's required yard periods every 15 to 18 months. Note the new heavier, taller mainmast stepped on the aft section of the stack surmounted with a SC2 set. An SK 2 set is installed atop the foremast. The ship is once again wearing Ms22. As the BB60 again wears today (2008), after many years in Ms13 with large hull number, which like BB59, BB60 never carried in active service.



Left: 22 Mar 1945 Puget Sound. BB60 after final overhaul. Note the broad beam and the wave and wake pattern.

Below: circa Apr 1945. Unknown location. BB60 underway. Note the crew in Dress Blues standing at quarters. An SG set on is fitted on a small platform on the front of the forward fire control tower, all USN 3rd generation initially carried an SG set in this location. A second set SG set was later added to mainmast and the set on the firecontrol platform relocated atop the foremast in order to provide 360° surface coverage.

Iowa Class: 6 Battleships of 1939/40:

USS Iowa BB 61 USS New Jersey BB 62 USS Missouri BB 63 USS Wisconsin BB 64

(USS Illinois BB 65 canceled USS Kentucky BB 66 (BBG 1) canceled)

The Iowa BB61 class ships were the first USN battleships designed to the 45,000 ton displacement limit when the increase in maximum permitted tonnage clause of the Washington Naval Treaty was invoked by the USN in 1938. The BB61 class ships were the final design of USN battleships to be completed. With four of the six ships ordered being finished. The BB61 class ships were the end product of an extensive and careful design process that resulted the apex of the USN's, if not the world's, battleship designs.

The BB61 class mounted a main armament of 9 16"/50 Mk7's in 3 triple turrets. A secondary battery comprised of 20 5"/38's mounted in ten twin gunhouses. The standard BB61 class light AA battery was comprised of 80 40mm and 64 20mm single mounts. The BB61's internal armor belt protection system was almost identical to the preceding BB57 class, providing protection against 16"/45 shellfire. Technically made the BB61 class another 'unbalanced design' ,as the ships were not designed to resist their own caliber of gunfire. The BB61's greatly enlarged and improved geared turbine engineering plant provided a 25% increase in the Shaft Horse Power (SHP) output of the engineering plant over the BB57 class. Which enabling a 6 knot increase in the maximum designed speed to 33kns. Overall design parameters of the BB61 class were based upon scaling up the BB57 class, with the 200' increase in length, and 10,000 ton increase in displacement devoted primarily to increasing the size and the power output of the engineering plant. And to providing the required additional armored protection to cover the increase in hull volume.

The BB61 class ships were stable gun platforms, and outstanding seaboats. They had a slight tendency to be wet forward at speed, or in a seaway around turret 1 due primarily to the contours of the long slim profile of the hull lines forward. This long slim hull profile also helped make them very quick to respond to helm commands, resulting in extremely agile and maneuverable for ships for their size (a BB61 class ship could turn inside a DD445 class destroyer). Lengthening of the hull also provide a greater 'length to beam ratio' (8:1) which meant decreased hull resistance resulting in an increase in speed for a given power rating.

The original design specified a slightly bulbous bow similar to the South Dakota class, but prior to construction the bow design was revised to accommodate extended anchor hawse pipes located just aft and below the bow peak on a flared bulb placed above the raked stem. This was done to allow the anchors to clear the bulbous underwater bulb at the foot of the hull. The BB61's mounted two stacks, with the forward stack flared into the aft of the forward fire control tower, the second stack was placed just forward of a medium height after main battery fire control tower.

The BB61 design featured a long sweeping single level maindeck, a clean hull with no portholes, and a clean waterline with an internal main side armor belt. A slightly over hanging gun tub for two single 20mm mounts was added forward at the extreme bow to BB61/BB62 in Jul/Sep1943. BB63 and BB64 were completed with them. Theses tubs were retained into the postwar years after the 20mm's were removed. BB61 alone featured a guntub for 3 20 mm single mounts mounted transversely atop of back of turret 2 in lieu of the standard 40mm quad mount fitted on the other 3 ships. This was to allow better visibility to the flag bridge located below the main bridge.

As completed BB61 and BB62 had open bridges. Prior to transferring to the Pacific BB62 had her bridge enclosed with rounded bridge structure (unique to BB62). BB62 carried this bridge until receiving a standard BB61 class 'squared off' type bridge in Aug 1945. BB61 retained the open bridge until overhaul in Dec 1944 at which time the ship also received a standard 'squared off' design bridge structure. BB63 and BB64 completed with the standard 'squared off' type bridges.

Construction times for the BB61 class ships was very short for their size, averaging 32 months each. Given the rapidness of their construction, the BB61 class experienced no failures, nor shortcomings as a result. The quality of materials and workmanship, have withstood the test of time. This quality is largely responsible for extraordinary longevity of these ships.

As these ships were of a modern design they received minimal modifications during WWII and up until the end of the active service periods in the 1950's. Modifications consisted of upgrading of radar systems and rearrangement of the mainmasts.

The USN had intended to keep the all 4 of the BB61 class ships in service after the close of WWII. But postwar funding reductions sent BB61 BB62 and BB64 into the reserve fleet by 1948. By 1949 BB63 alone remained in service and was deployed primarily as a training ship out of Norfolk NS. In 1946/47 BB61 BB63 and BB64 had their light AA batteries reduced by the removal of almost all 20mm's. BB62 alone retained the full 20mm complement into reserve in 1948, and after Korean War reactivacation. However, BB62's 20mm's were removed prior to deploying to Korea.

Shortly after the outbreak of the Korean War in June 1950, the decision was made to return the 3 out of service Iowa's to active duty in order to provide fire support to UN forces ashore. And to provide heavy surface escorts for the UN fast carrier task forces. During reactivacation BB61 was fitted with a cantilevered mainmast, fitted with an SP2 radar. BB62 had received the cantilevered mast in 1945, BB63 in 1949. BB64 alone retained an extended pole mainmast topped with a type SC4. In 1954/55 the 4 BB61's had their mainmasts replaced with a four legged lattice mast surmounted with an AN/SPS8A Height Finder radar. In 1955 BB61 and BB64 had derrick style crane kingposts installed aft of the number 2 stack with the rear legs of the lattice masts affixed to the cross posts of the kingpost to facilitate underway fueling. At this time BB61 and BB64 had their aircraft handling cranes removed from the fantail.

By 1955 BB61 and BB64 also had the 40mm quad mounts and guntubs were removed from the forecastle and from abaft the after turrets. On BB61 and BB6 the amidships 03 level triplex 40mm platforms, the 2 center 40mm mounts were removed and replaced with Mk56 AA directors, 2 Mk 56's were also installed just forward of the beam Mk37 directors abaft of the forward stack and a further 2 were fitted abaft the after fire control tower. The 2 Mk57 directors were retained just forward of the 40mm's on the fantail. It was authorized in the mid 1950's to refit the BB61 class ships with twelve twin 3"/50 mounts (SCB74E) but the project was canceled due to the ships being scheduled for decommissioning.

Starting in 1955 the BB61 class ships were again placed into reserve. By April of 1958 the last active battleship in the USN (BB64) had been placed out of service. For the first time in 62 years, since the USS Maine of 1896, the USN did not have a battleship type in commission.

In 1963 the DoD evaluated disposal of 2 of the Iowa's (BB61 BB63). During this evaluation the state of Missouri expressed interest in acquiring BB63 as a museum ship to be located at St Louis. However, at the request of the US Marine Corps, which perceived a continued need for a heavy fire support requirement, the decision was made to retain the ships.

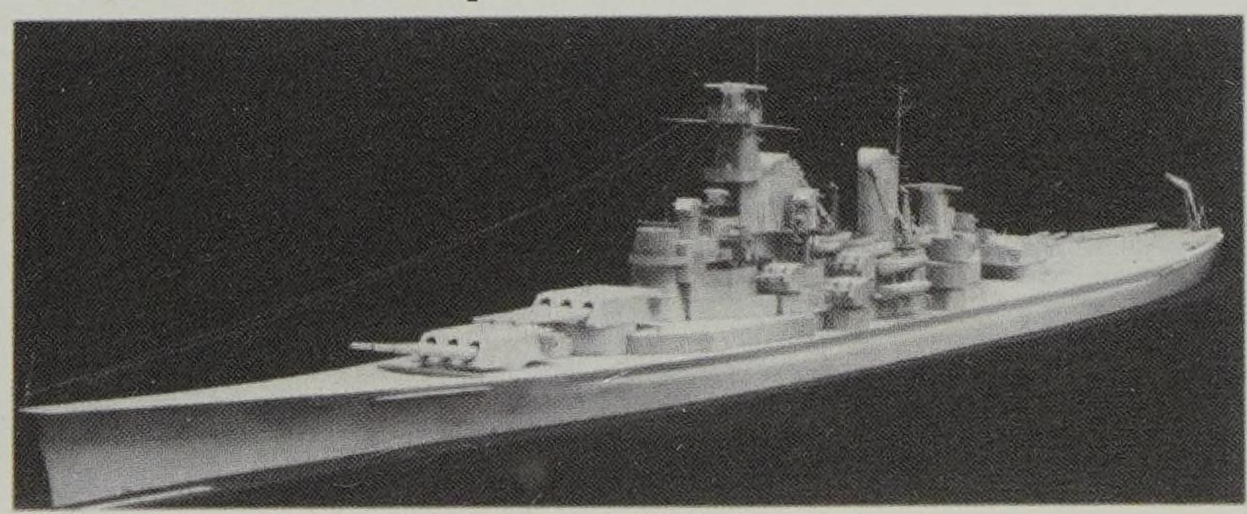
The fifth and sixth ships of the Iowa class, the Illinois BB65 and Kentucky BB66 were to be slightly improved versions of all welded construction (BB61-BB64 were of riveted construction as were all preceding USN BB designs). A 5% increase in armor protection was projected. These changes were expected to result a slight reduction in the designed displacement and resultantly a slight increase in speed. BB65 was canceled when the ship 22% complete in Aug 1945, the unfinished hull was scrapped 12 years later on the ways in Sep 1958. Work on BB66 was suspended indefinitely in Aug 1946 when the ship was 82.9% complete but not yet launched. This was to allow for design changes to be derived from the evaluation of Operation Crossroads test data. Construction was resumed in August 1948 to get the ship ready to launch to clear the drydock she was being constructed in. BB66 was floated out in Jan 1950 to clear the dock for the repair of BB63's grounding damage. In Feb 1950 construction was once again suspended. The unfinished hull was complete to the second deck, but lacked all armament and superstructure. BB66 was placed in storage at Norfolk NSY. In Jun 1956 BB66 had the forward 68' foot section of the ship's bow removed, and used to replace the bow section of BB64 which had been damaged in a collision with a destroyer. Numerous conversions of BB66 to a guided missile battleship (BBG/BBMG) were studied from 1946-1958, some were funded, and subsequently canceled, others were just preliminary design studies. In the end none was realized and the unfinished hull of BB66 was sold for scrap in Sep 1958. The salvaged main machinery from BB66 was installed with ½ the plant, 2 shafts each in the first two Sacramento class Underway Replenishment Ships (AOE1/2), which enabled these 49,954 ton ships to attain speeds of 26 kns.

As a result of the overall satisfactory balance of design characteristics of Iowa class they were considered to be among the best classes of ships of any type ever to be designed for the USN. Featuring heavy firepower, coupled with an accurate fire control system, excellent armor/protective systems and an outstanding machinery plant The excellence and soundness of their design has been reflected the longevity of their careers. Which spanned over 6 decades of intermittent active service periods. The Iowa's were truly excellent ships in every category and were unquestionably the most successful, and the most powerful design of BB to be built. Perhaps the finest testament to the continuing soundness of the design is that, to date (2009), the USN maintains reactivacation plans for the Iowa's as fire support ship. Despite having been first commissioned over 60 years ago. Which is amazing considering the BB61 class ships were completed in the early 1940's to counter foreign battleships(Yamato and Bismarck) that have long since been relegated to the pages of history. The BB61 class are the last remaining operational BB's' in the world. The UK and Italy disposed of their last BB's in 1957 France disposed of their last BB in 1970.

However, given the inevitable obsolescence of the machinery plant and all shipboard systems it would appear probable that the final chapter of Iowa class Battleships as operational units has at finally been written.

Iowa Class Battleships Statistics 1945

Displacement	Standard Design/Actual/FL		45,000 tons/52,000/56,270 tons
Dimensions	Length WL/OA/Beam		860'0"/ 887'3"/108'2"
	Draught (max)		35' 3/4"
Machinery	Type		4/Geared Turbines
	Boilers		8 (oil fired) 600psi 850F
	Shafts/designed SHP		4 shafts 212,000 shp nominal
	Rudder		twin
	Max Designed Speed		32.5 knts
	Weight of Eng Plnt		4,443.8 tons
	Fuel bunkerage/Range:		6,835/14,890 nm @15.0kns
	Tactical Diameter		814 @ 30kns
	GM		7.68
Armament	Weight of Broadside		24,300Lbs/12.5tons
	Projectile Weight		2,700lbs/1.35tons
	Max range:		42,345yds/24.0 miles
	Rnds/Weight per Min		2.0/25tons
	Rnds per gun/Total Rnds		130/1170
	Main		9-16"/50
	Sec		20-5"/38
	AA	1945	64-40mm 54-20mm/BB61 60-40mm 57-20mm
		1952	64-40mm /BB61 60 40mm
		1957	BB61/BB64 32/36-40mm
Protection:	Main (wl) Belt/ Incline		12.2" +1.5"/ 19°
	Deck		8.175"/4 decks
	Turret:		17.0 face 10" side 12" top 10" back
	Total Armor Weight		10,175.3 tons (min)
Catapults/Aircraft	1945/1950		2 Cats 4 Aircraft/0 Catapults 0 Aircraft



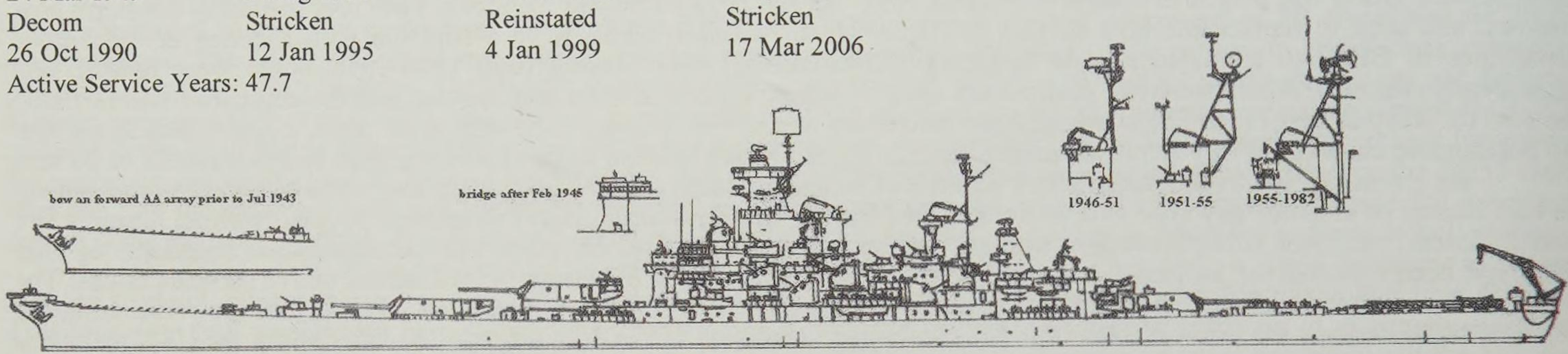
Circa 1938 Design model of BB61 class. Note the bow, hull recess, amidships boats, and handling cranes are as in the BB57 class. BB61 had the boat cradles installed but removed, and replaced with the triple 40mm gun tub array prior to completion.

Battleship USS Iowa BB61 Call Letters: **NEPM**

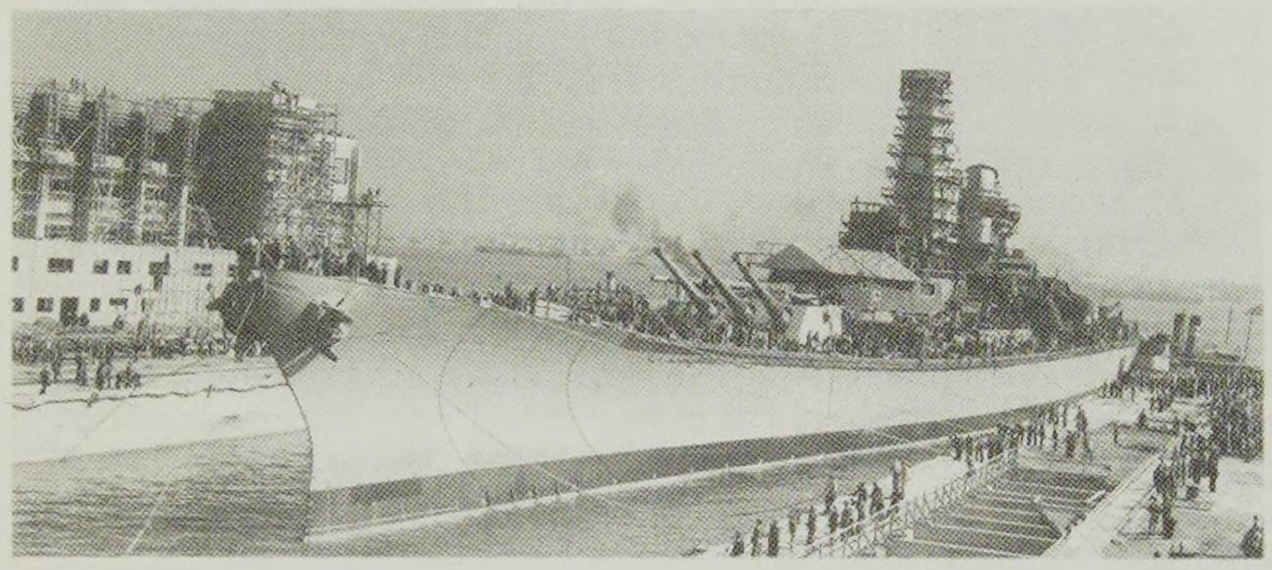
Builders Yard:	New York NSY Brooklyn NY
Reserve Group	1949-1951 San Francisco NS CA
Reserve Group	1958-1982 Philadelphia NSY PA
Reserve Group	1990-1998 Norfolk NSY VA
Reserve Group	1998-2001 Newport RI
Reserve Group	2001-2008 NDRF (MARAD) Suisun Bay CA
Scrapping Yard	-

Ordered	Keel Laid	Launched	1st Comm
1 Jul 1939	27 Jun 40	27 Aug 1942	22 Feb 1943
Decom	Recom	Decom	Recom
24 Mar 1949	2 Aug 1951	24 Feb 1958	8 Apr 1984
Decom	Stricken	Reinstated	Stricken
26 Oct 1990	12 Jan 1995	4 Jan 1999	17 Mar 2006

Active Service Years: 47.7

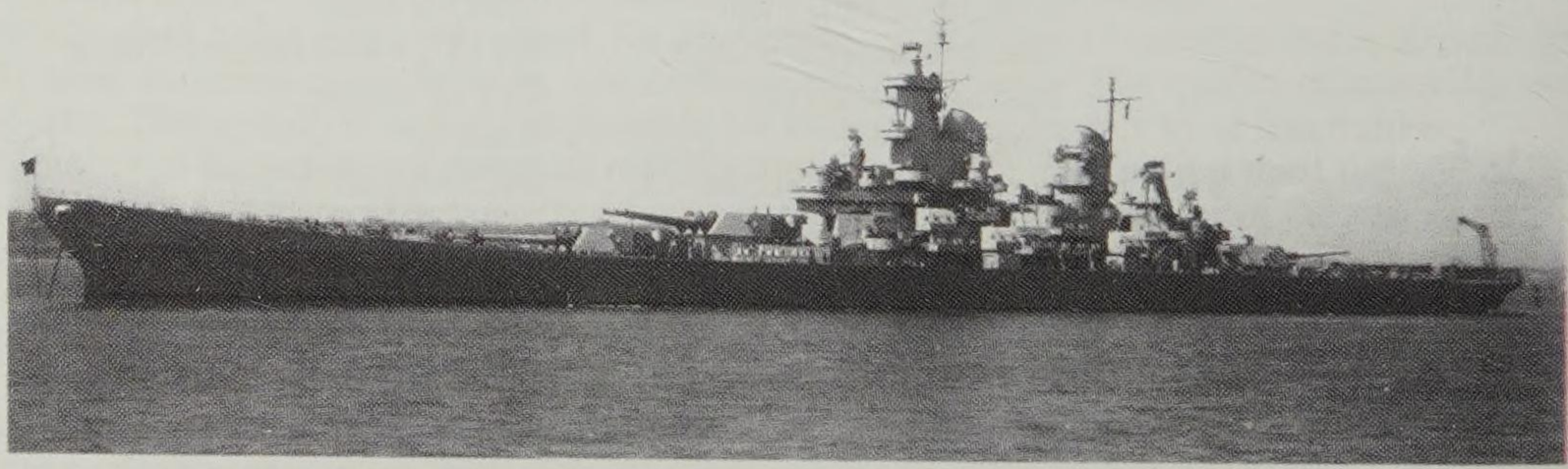


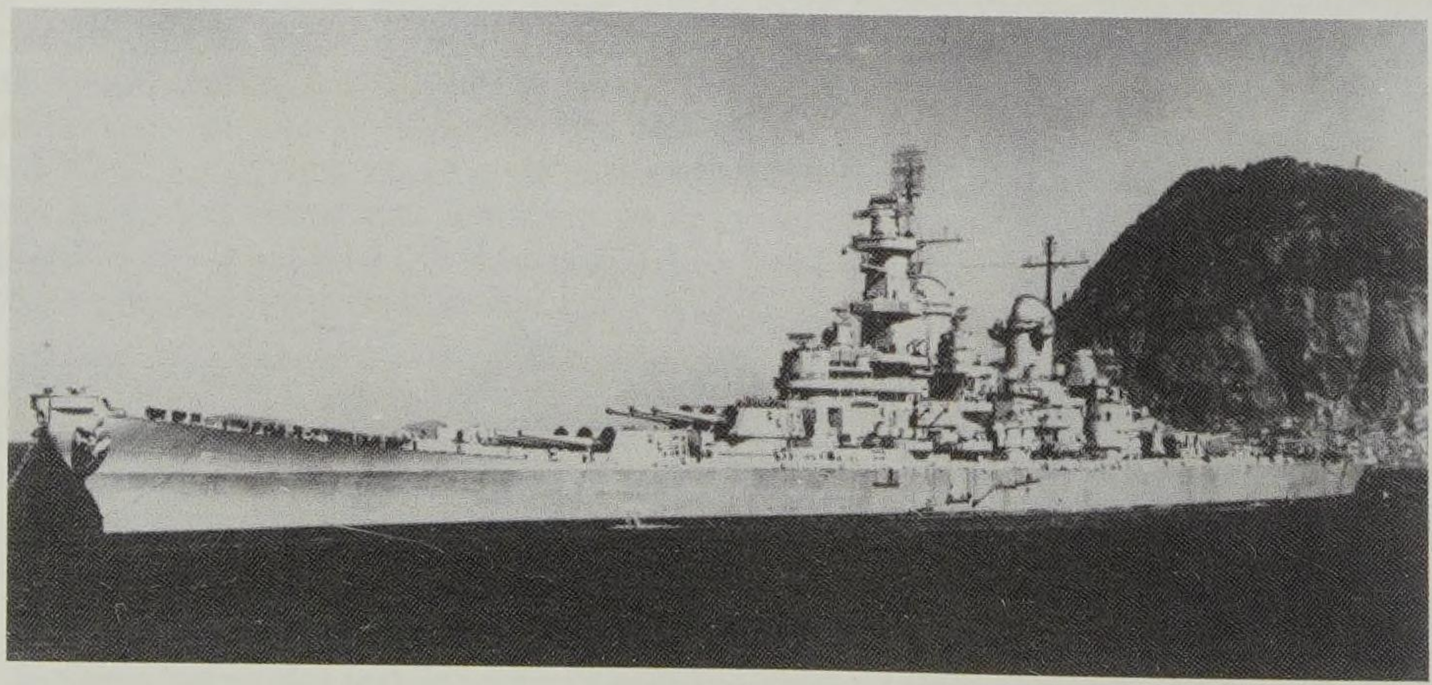
USS Iowa BB61 Nov 1944 Ms32/1b



Left: 27 Aug 1942 New York NSY. BB61 after being launched being warped to a pier in the fitting out basin, where the ship will spend the next 6 months. Notice the stacks and turret 1 are already installed, illustrative of the accelerated construction schedules of the BB61 class ships. Notice the flowing hull lines, and the scaffolding around the forward fire control tower, the bridge area, and lack of a hull number. The ship is painted Ms13. dbc

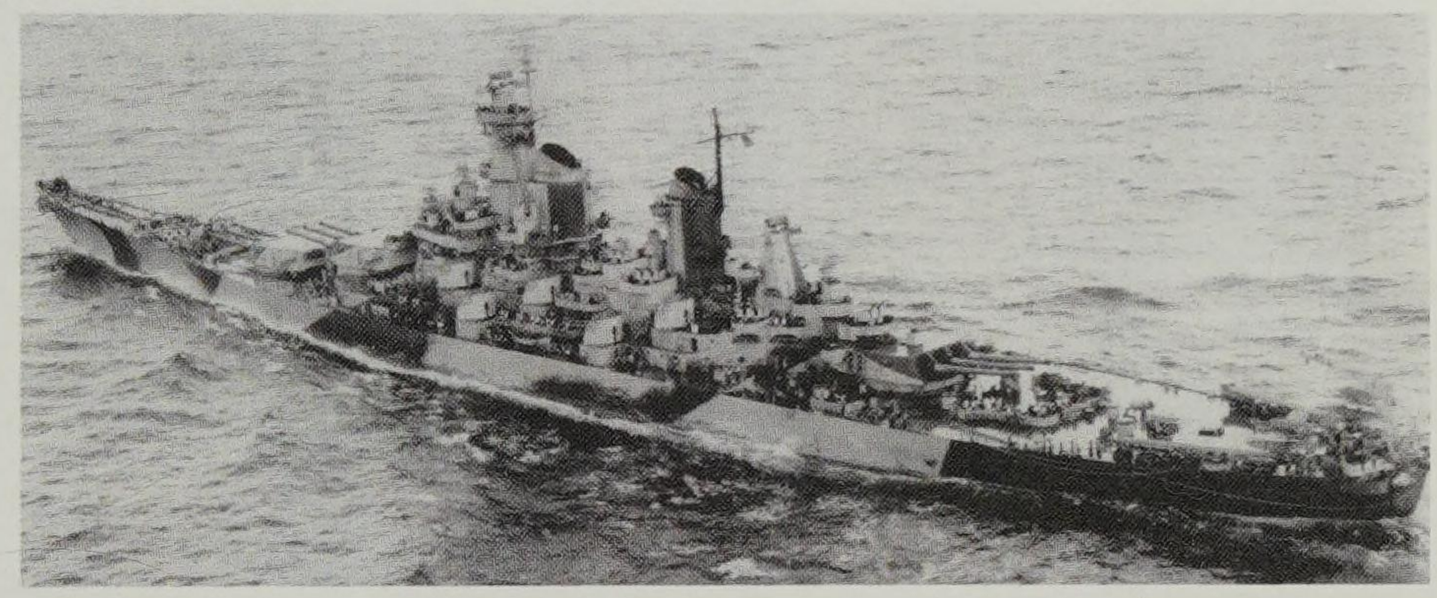
Right: 4 Apr 1943. NY harbor area. BB61 as commissioned appearance. Note lack of the bow guntub, the forecastle 20mm arrays, the minimal platform at the 06 level, and 20mm gallery atop turret 2. BB61 grounded in Casco Bay ME 16 Jul 1943. The ship received repairs and post shakedown inspection at the Boston NSY in Jul 1943.



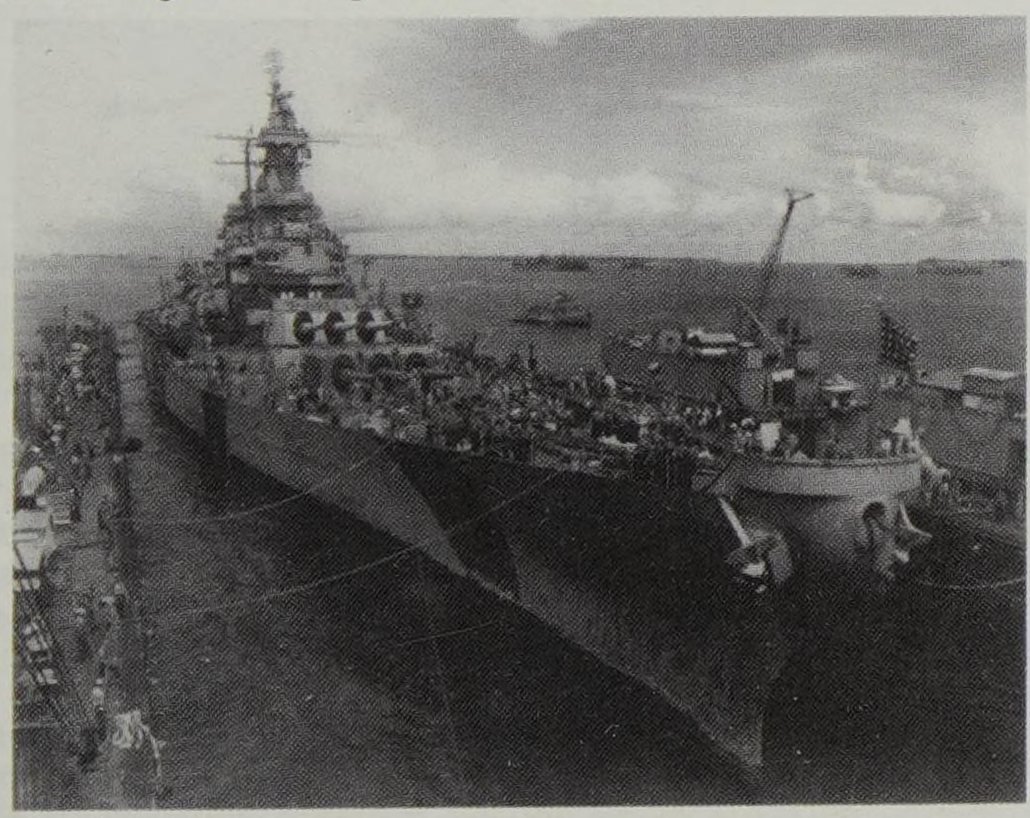


Left: Circa Nov 1943 Gibraltar Spain. BB61 after post shakedown modifications at Boston NSY. Note the new 40mm positions on the forecastle and the addition of the bow 20mm position and the 20mm gallery atop turret 2. BB61 is returning from transporting President Roosevelt to Mers el Kebir, Algeria for the Yalta Conference. In Oct 1943 prior to the voyage BB61 had a bathtub fitted for use by the President, the only USN BB so equipped. BB61 retained the open bridge until 1945. Note the painters over the side. The ship is painted according to Ms22. As commissioned Iowa's Ms22 graded system was comprised of a Ocean Gray Hull stripe with Haze Gray upperworks. dbc

Above: USS Iowa BB61 Central Pacific Nov 1944. BB61 fueling from the fleet oiler USS Salamonie AO26. Side by side underway replenishment techniques were developed by the USN just prior to the outbreak of the war in the Pacific. The utilization of underway replenishment techniques by the USN during WWII enabled the battlefleet to remain in the forward areas with full bunkers, magazines and storerooms. Oilers, Ammunition Ships, Stores Ships, Refrigerator ships and Aviation Supply ships shuttled a constant stream of supplies from West Coast ports. Replenishment was conducted when 2 or 3 ships steamed side by side at speeds of up to 15 knots, on parallel courses from 50' to 125' apart with cables and fueling hoses interconnecting them for up to 2 hours at a time.



Above: 24 Jan 1944 off Kwajalein. BB61 in an 'as applied' Ms32/1b pattern with 'feathered' edges. The 'feathered' edges of the pattern were replaced with sharp edges by Nov 1944. Note the fantail aircraft handling facilities typical of USN 3rd generation BB designs. dbc

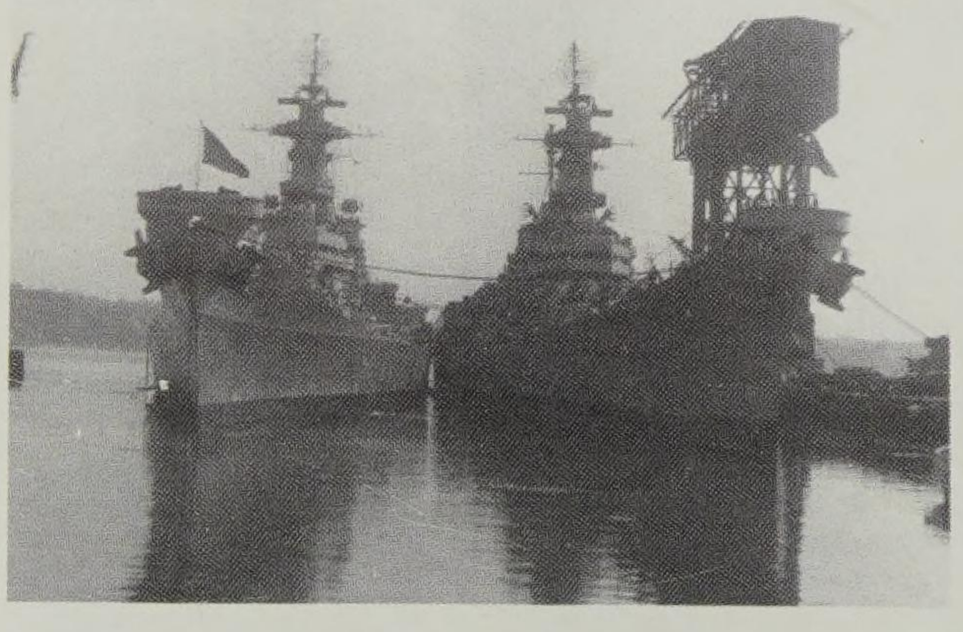


Left: 28 Dec 1944 ASBD2 Apra Harbor Guam. BB61 entering drydock to check the No1 shaft bearing. As the bearing had dropped out of position BB61 was dispatched to Hunters Point NSY for overhaul arriving in Jan 1945. The ship returned to the Pacific theater in Apr 1945. The ship is painted Ms32/1b now with sharp edges on the pattern. Note fine hull form forward which was achieved at some compromise as to the depth of the underwater protection system abaft of turret 1.

Right: Circa Dec 1944 location unknown. BB61 at sea enroute to overhaul. BB61 was the only one of the class to carry the open bridge into the Pacific Theater. Note the O2SU's and the apparent lack of the stern aircraft crane which has been struck and stored flat on the deck. dbc

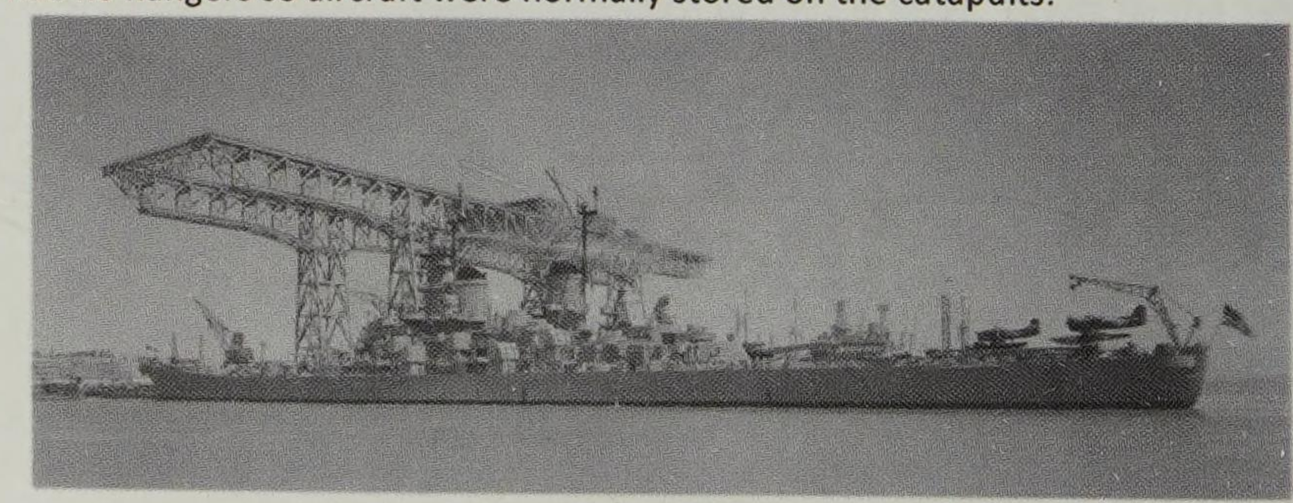
"Battleforce Pacific" The USS Iowa BB61 in the South Pacific Jan 1944. Iowa is leading a line ahead formation as the Battleline of Admiral Lee's TF34 unleashing a pre invasion softening up bombardment on enemy positions on Kwajalein in the Marshall Islands. Following close up behind are the battleships New Jersey, Indiana, and Washington. The Iowa class represented the crowning achievement of USN battleship design, incorporating all the advantages of the fast Battlecruiser type with none of their weaknesses. Following is the New Jersey BB62 in Measure 21, then the Indiana BB58 in Measure 32/16d and trailing is the Washington BB56 dressed in a Measure 22 graded system.

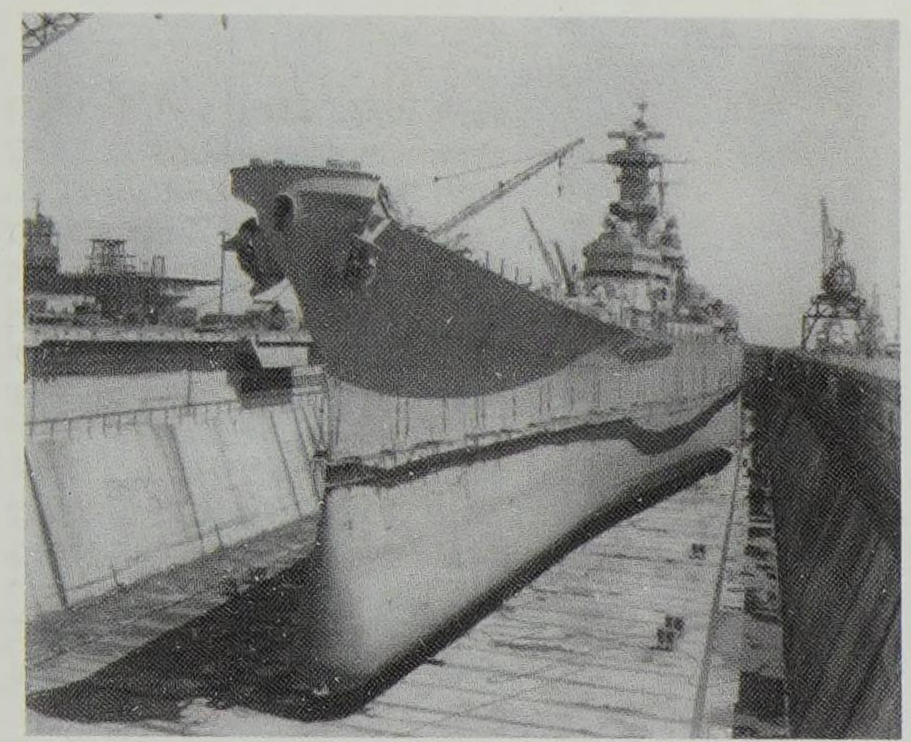
Right: 18 Mar 1945 San Francisco Bay. BB61 after overhaul. Note the enclosed bridge, the SK1 atop the foremast and the SC2 atop the extended mainmast. Paint is Ms22. By 1947 an SK2 would replace the SK set BB61 was mothballed at Hunters Point NSY in 1948-1951.



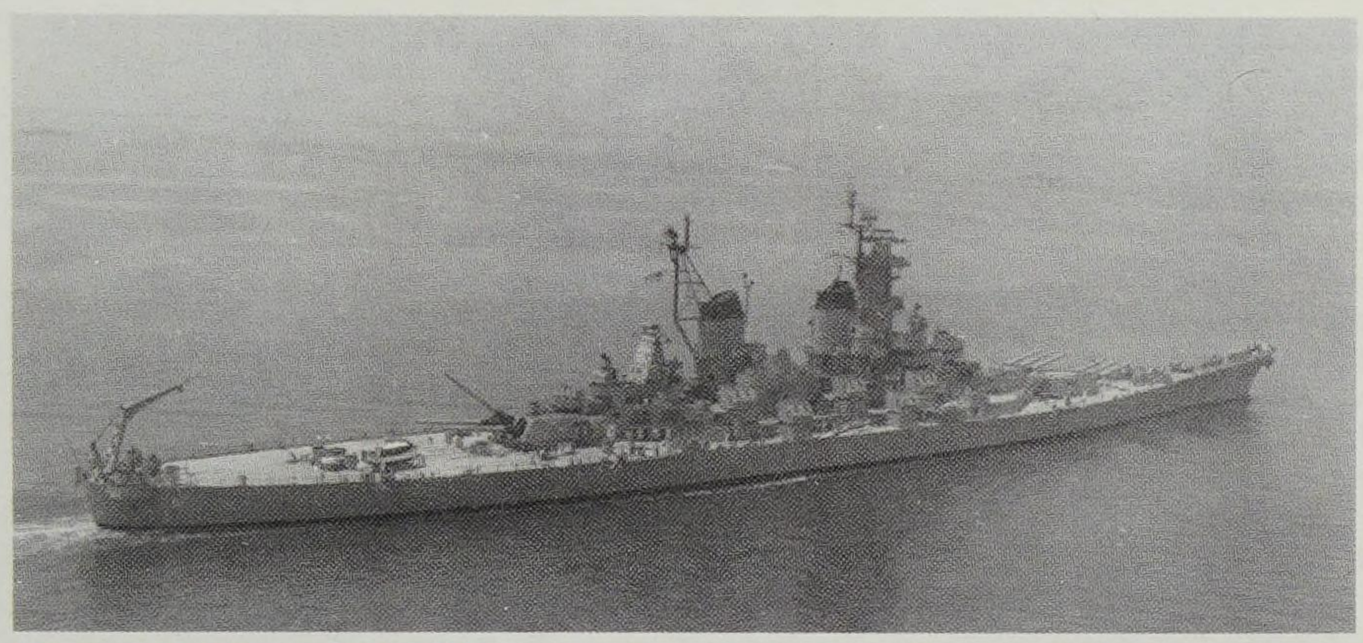
Left: Circa Mar 1946 Puget Sound NSY. USS Iowa BB61 (R) USS New Jersey BB62 (L) Both ships were idle due to inadequate manning levels at the time. Note the BB62 retains wartime camouflage paint Ms22 and that BB61 has been repainted to Ms13. By 1948 all US BB's in active service and in reserve had been repainted to Ms13 overall Haze Gray. In 1946-47 BB61 was the only BB to have large unshadowed hull numbers and be painted Ms13 including the stack caps. dbc

Below: 18 Jul 1947 Hunters Point NSY. BB61 with California Governor Earl Warren and 12 guests embarked prior to sailing to Hawaii. Note the tall pole mainmast topped with an SC4 set and the catapults with SC1 Seahawks embarked. USN BB's had no hangers so aircraft were normally stored on the catapults.



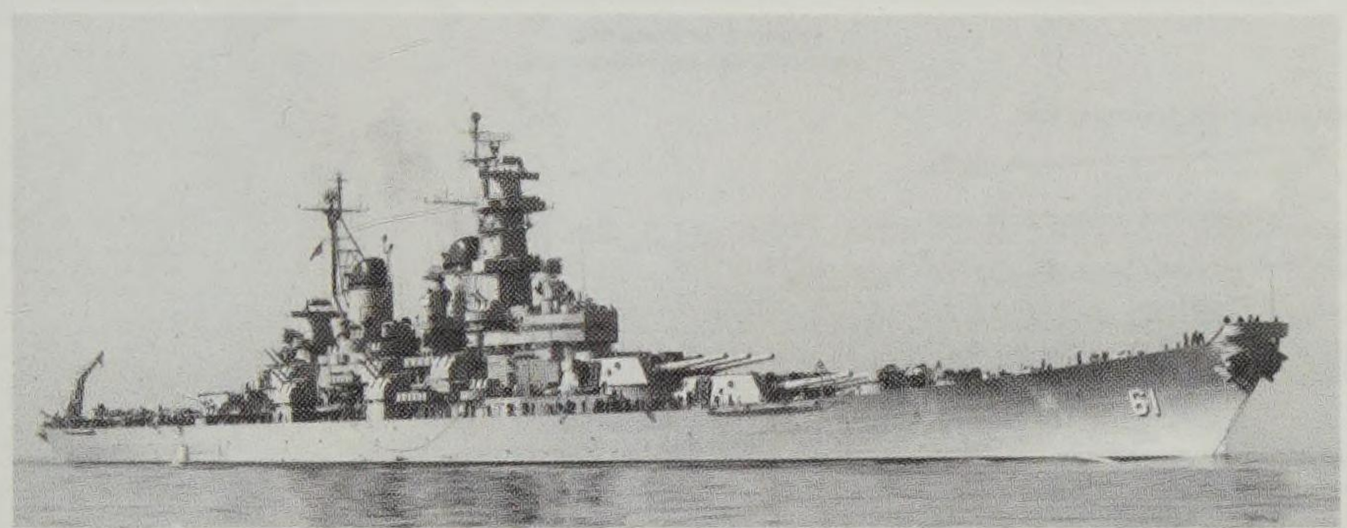


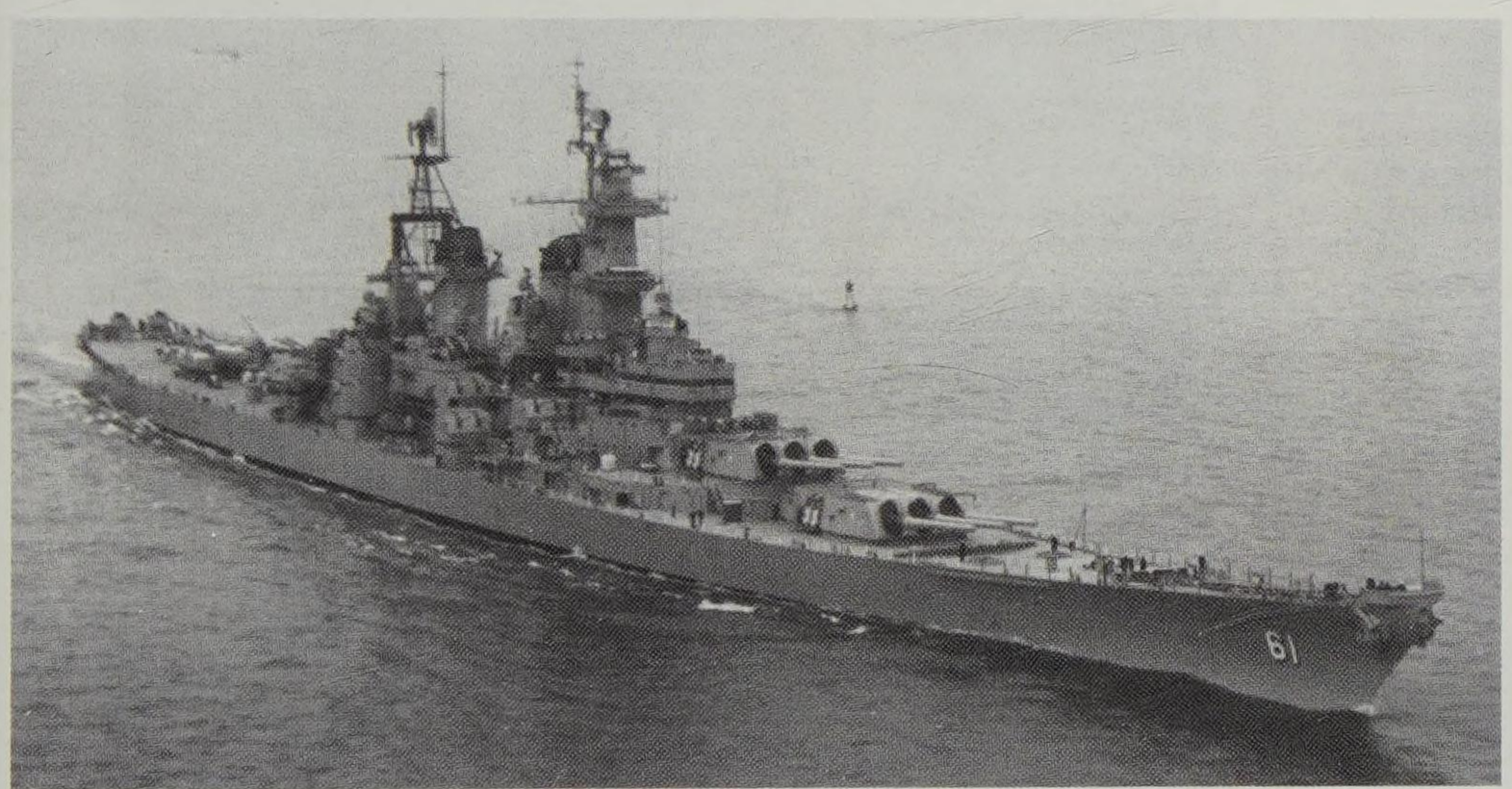
Above: 27 Jul 1951 Hunters Point NSY. BB61 undergoing reactivacation overhaul. Note the scaffolding and canvas covers over the waterline boot topping to prevent paint overspray.



Circa early 1952, BB61 off San Francisco. Painted Ms13 with Black stack caps, large hull numbers painted on the bow and stern counters. Note the cantilever mainmast topped with an SP2 set. dbc

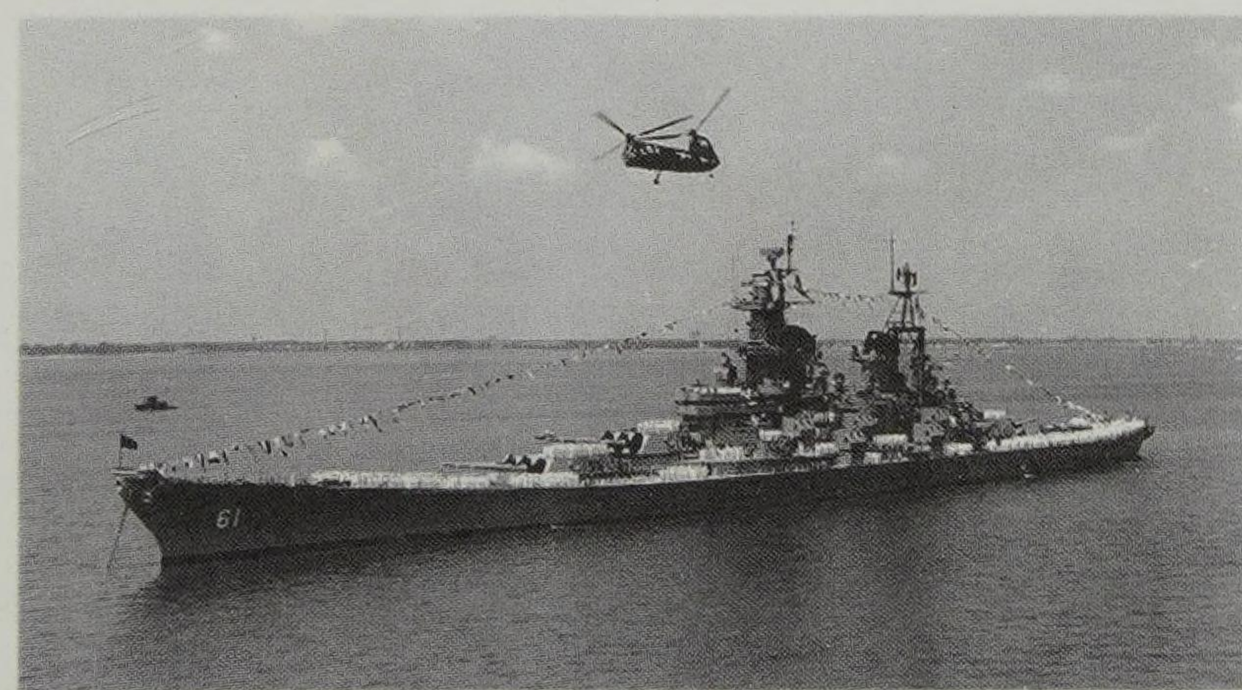
Right: Circa Nov 1952 off Pearl Harbor. BB61 returning from duty off Korea. BB61 served 1 tour in Korea, from Apr-Oct 1952. Upon return BB61 transferred to the Atlantic Fleet until decommissioning in 1958. Note the absence of a 40mm mount atop the No.2 turret unique to BB61. The "domes" on the after stack are DPM Navigation Aids (NavAids) which were also fitted to the BB63 during 1953-1955. Note the Mk12/Mk4 FC radars.

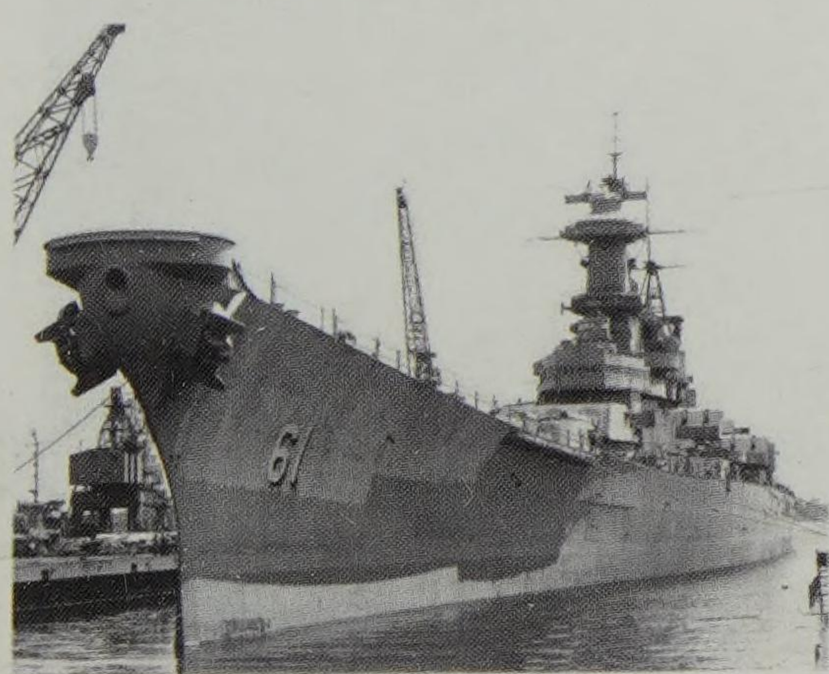




Circa 1956 BB61 off the US East Coast. Note the AN/SPS8A height finder radar atop the 4 leg lattice mainmast, and the kingposts with derrick style cranes supporting the mainmast. Mk25 radars have replaced the Mk12/22's atop the Mk37 DP directors. 6 Mk56 40mm battery directors have been installed, and 6 quad 40mm mounts have been removed in accordance with the scheduled SCB74E 3"/50 AA battery installation. This is BB61's final appearance prior to decommissioning in 1958.

Right: 11 June 1957. Hampton Roads, VA. BB61 at "dress ship" (signal flags flying fore and aft) for the International Naval Review. The crew is standing by at quarters awaiting arrival of the Piasecki HUP Retriever Helicopter.



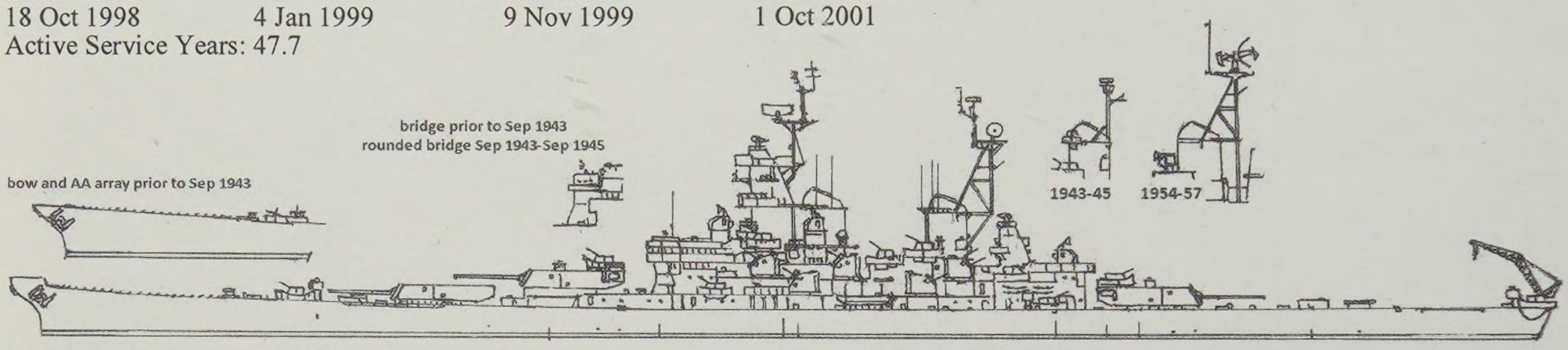


Left: 2 Aug 1962 Philadelphia NSY. BB61 in reserve, entering drydock for routine hull maintenance. Note the hull paint down to the light displacement waterline. The BB61 class ships received routine checks while in reserve to ensure their readiness for reactivacation. BB61 mothballed at PhNSY. BB62 and BB64 mothballed at Bayonne NJ and in Aug 1962 were moved to PhNSY. BB63 was at Puget Sound NSY.

Battleship USS New Jersey BB62 Call Letters: **NEPP**

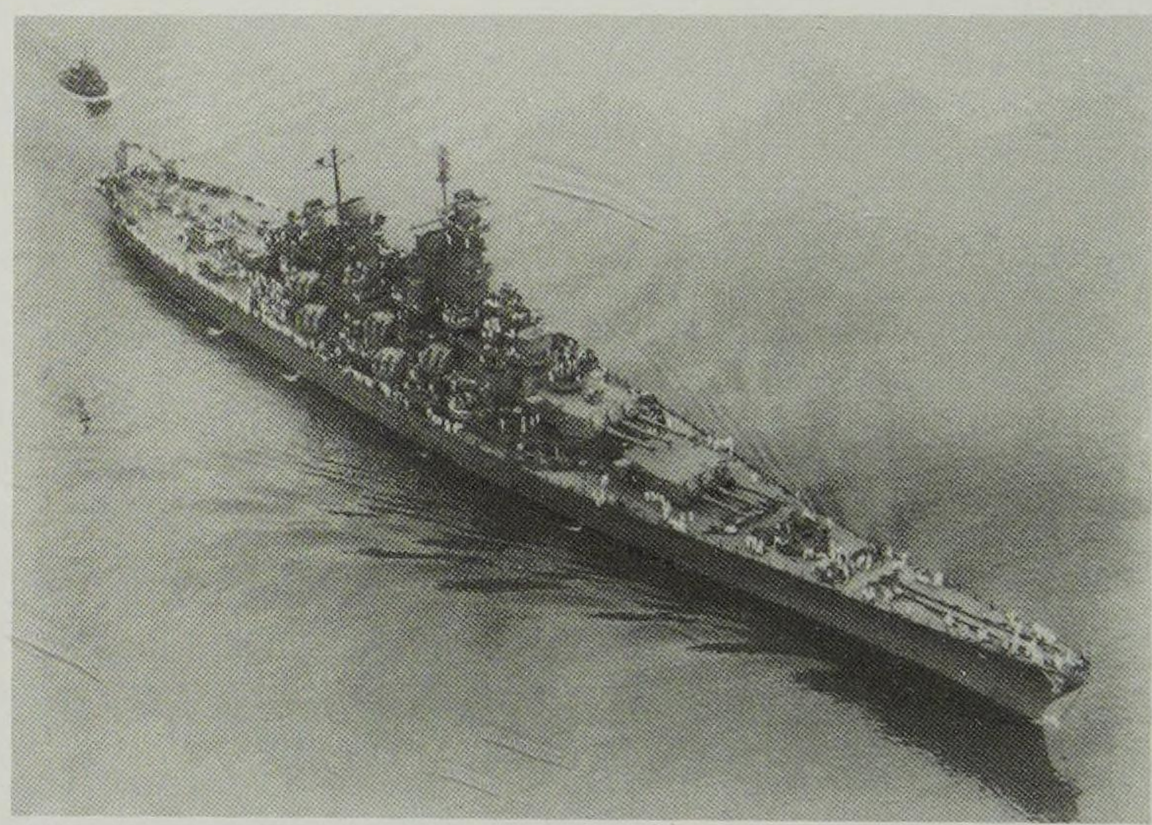
Builders Yard	Philadelphia NSY PA		
Reserve Group	1948-1951 Bayonne Naval Annex NJ		
Reserve Group	1957-1962 Bayonne Naval Annex NJ		
Reserve Group	1962-1967 Philadelphia NSY PA		
Reserve Group	1969-1981 Bremerton NSY		
Reserve Group	1990-2000 Bremerton NSY		
Scrapping Yard	-		
Museum Location	2001-2007 Camden NJ		
Ordered	Keel Laid	Launched	1st Comm
1 Jul 1939	16 Sep 40	7 Dec 1942	23 May 1943
Decom	Recom	Decom	Recom
30 Jun 1948	21 Nov 1951	21 Aug 1957	6 Apr 1968
Decom	Recom	Decom	Stricken
17 Dec 1969	28 Dec 1982	8 Feb 1991	12 Jan 1995
Reinstated	Stricken	Transferred	Dedicated
18 Oct 1998	4 Jan 1999	9 Nov 1999	1 Oct 2001

Active Service Years: 47.7

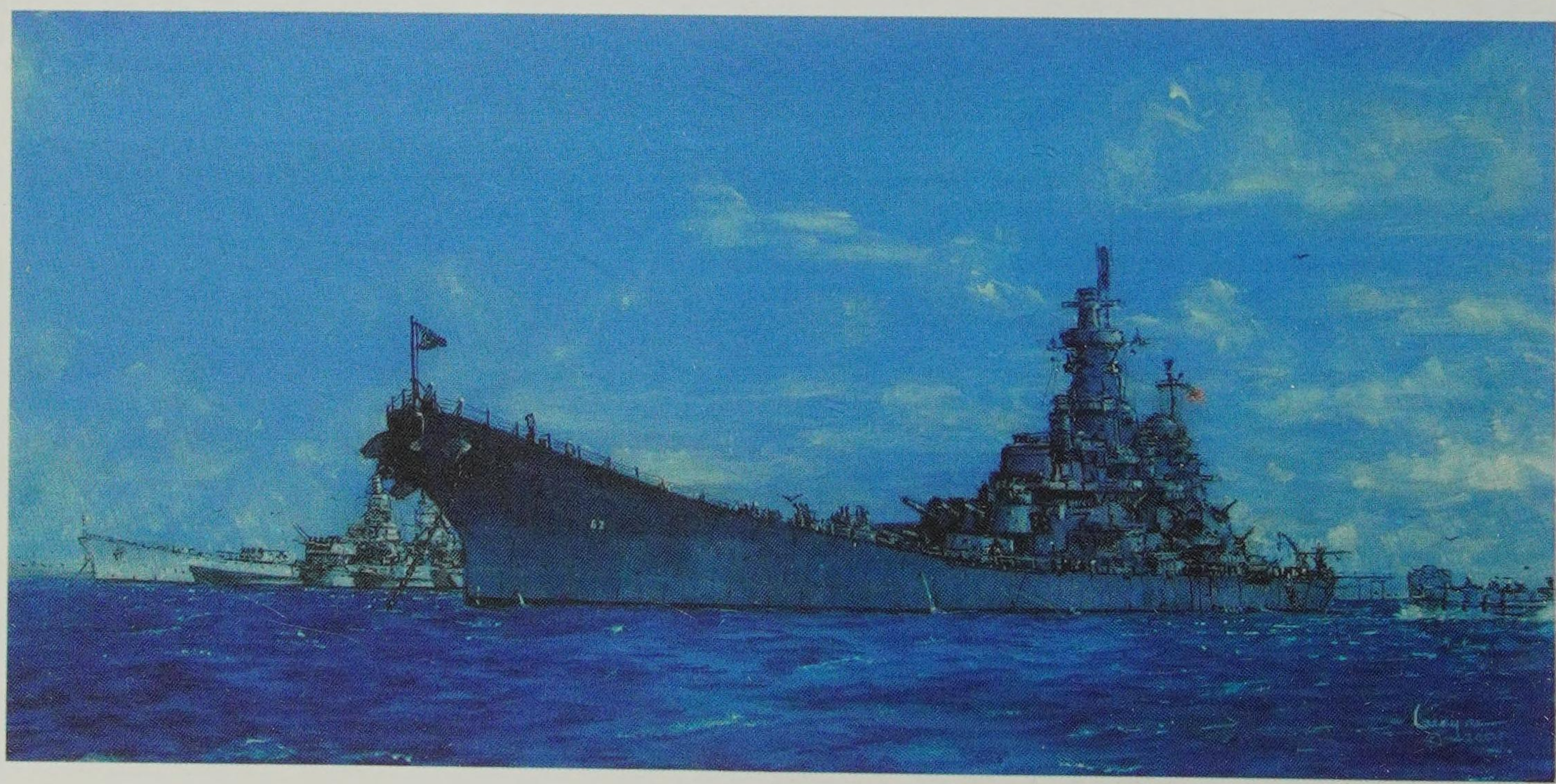


USS New Jersey BB62 Apr 1953 Ms13

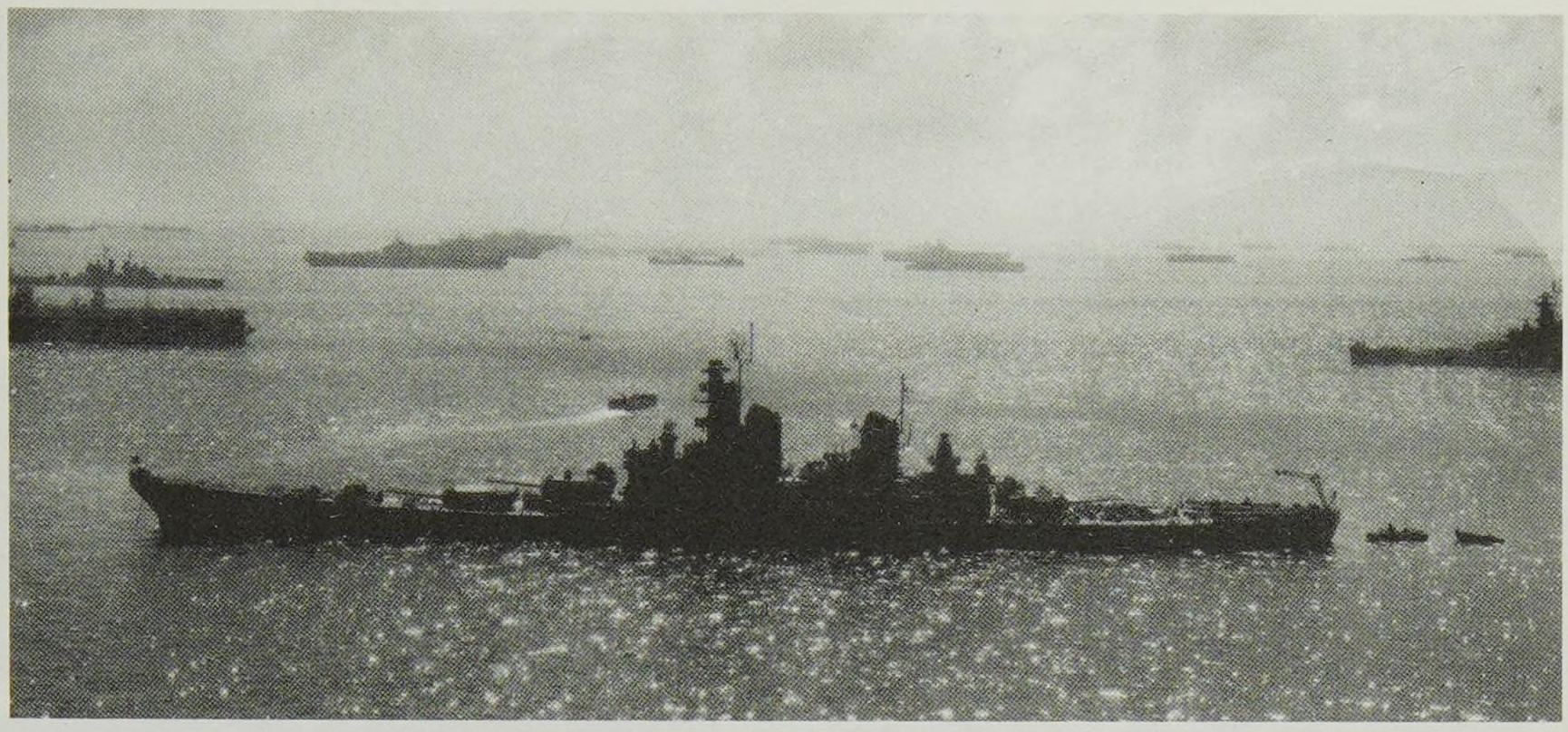
Right: 5 Aug 1943 off Philadelphia NSY Note the open bridge, forecastle 3 gun 20mm array and lack of gun tub on bow. These items were changed in Sep 1943 at PhNSY during BB62's post shakedown yard period. Paint is Ms21. dbc

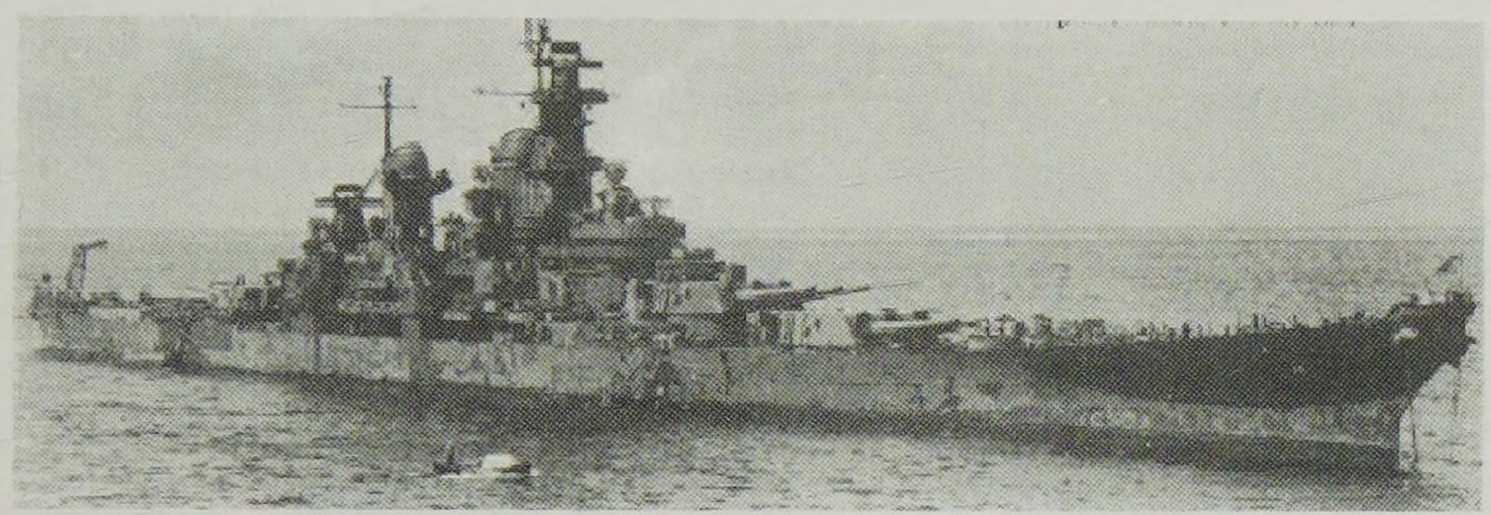


USS New Jersey BB62 Chesapeake Bay Virginia Jun 1943. At anchor in company of the Free French Battleship Richelieu which left Dakar, West Africa in Jan 1943 to join the allied cause. Richelieu was completed and modernized at the New York Naval Shipyard with a USN 40mm/20mm AA battery and painted in a USN Ms31a Dark Pattern System that she carried to the Pacific. After working up off the US East Coast with the New Jersey. Richelieu joined the British Far Eastern Fleet conducting operations in the Indian and Pacific Oceans assisting in the final months of offensives against Japan. New Jersey, fresh from her builder's yard is preparing to get underway to start her shakedown cruise. The New Jersey is painted Ms21 which BB62 carried for the ship's entire operational career in WWII.

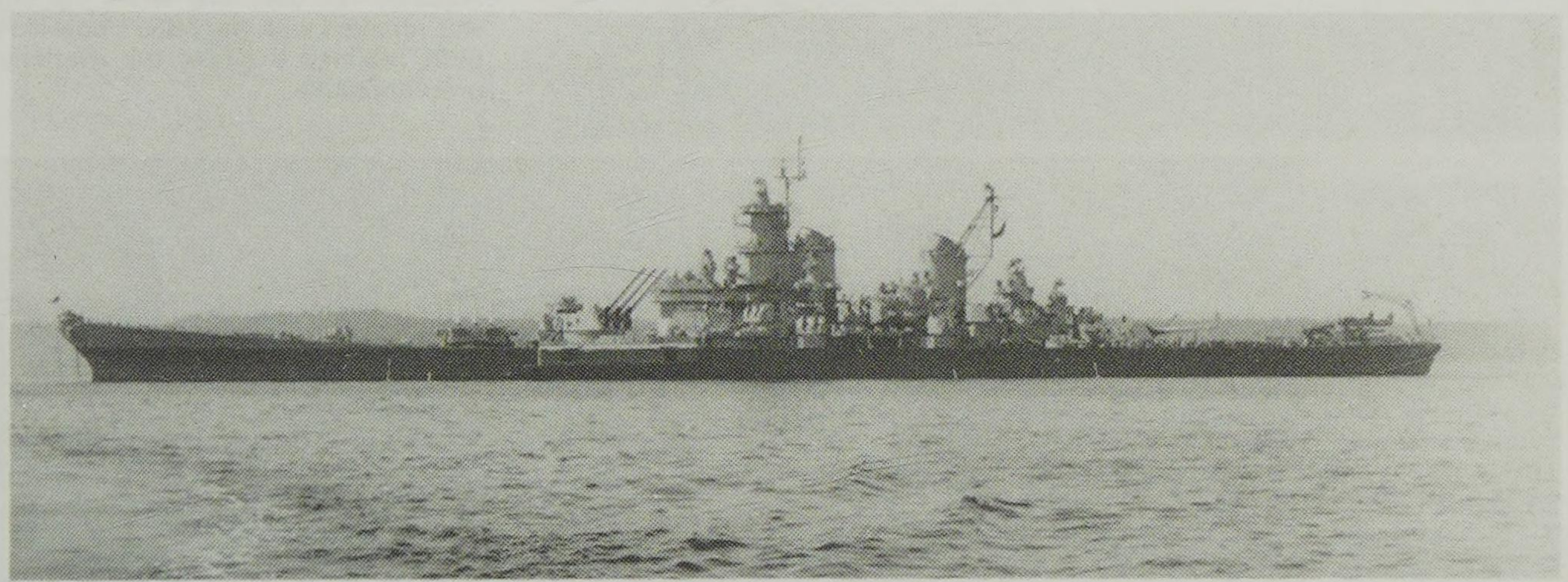


Right: 8 Dec 1944 Ulithi Atoll BB62 at anchor with elements of TF38. BB57 is in the right background. 10 CV/CVL's types are present. This photograph gives an indication of the immense power the USN was able to deploy against Japan from mid 1944 onwards. In 1945 the USN had 16 Fleet CV types, 8 Light CVL types, 10 3rd generation BB types, and 2 CB types operational. By Aug 1945 TF38/58 was capable of launching 1,000 plane strikes.

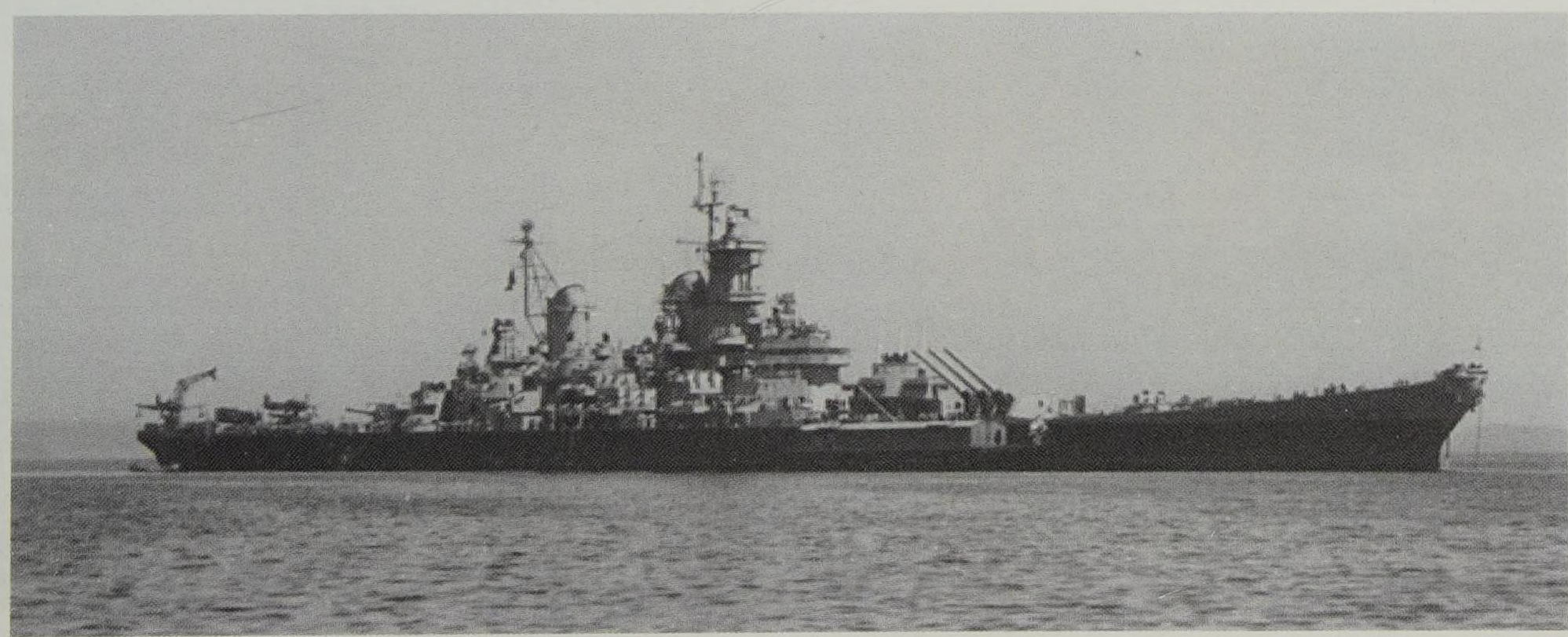


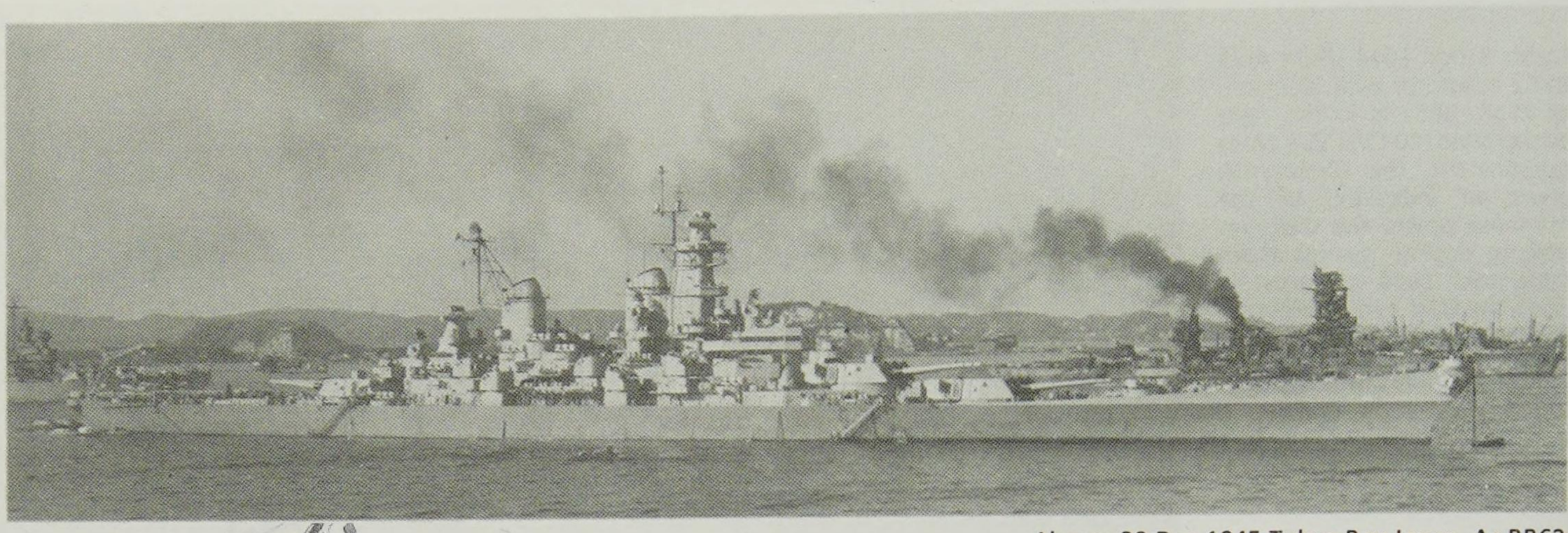


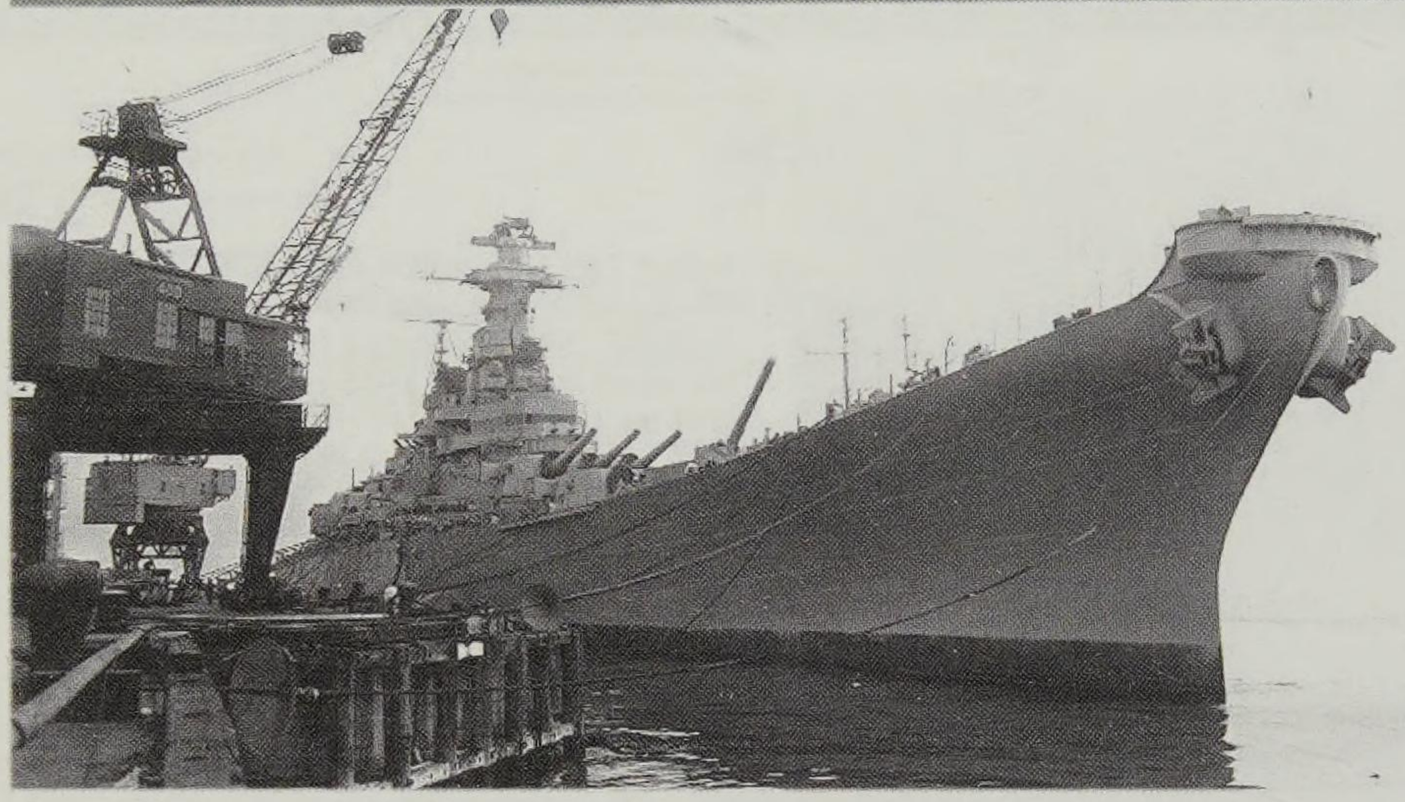
Left: 8 Feb 1945 Ulithi Atoll. BB62 in a weathered Ms21. Note the rounded bridge which was unique to BB62. BB62 departed from the Pacific Theater for overhaul in Apr 1945 and was at Puget Sound NSY on 2 Sep 1945.



Above and below: 9 Jul 1945 Puget Sound. BB62 loading ammunition after the completion of overhaul. Note the new "squared-off' bridge, the parabolic SK2 on the foremast, the cantilevered mainmast topped with an SP2 radar and the SC1 Seahawk floatplanes spotted aft. BB62 has guns elevated and turret 1 and 2 trained out to opposite sides in order to perform gun alignment and calibration checks on the fire control system (boresighting). BB62 retained this same basic appearance until 1954. Camouflage is Ms22. dbc



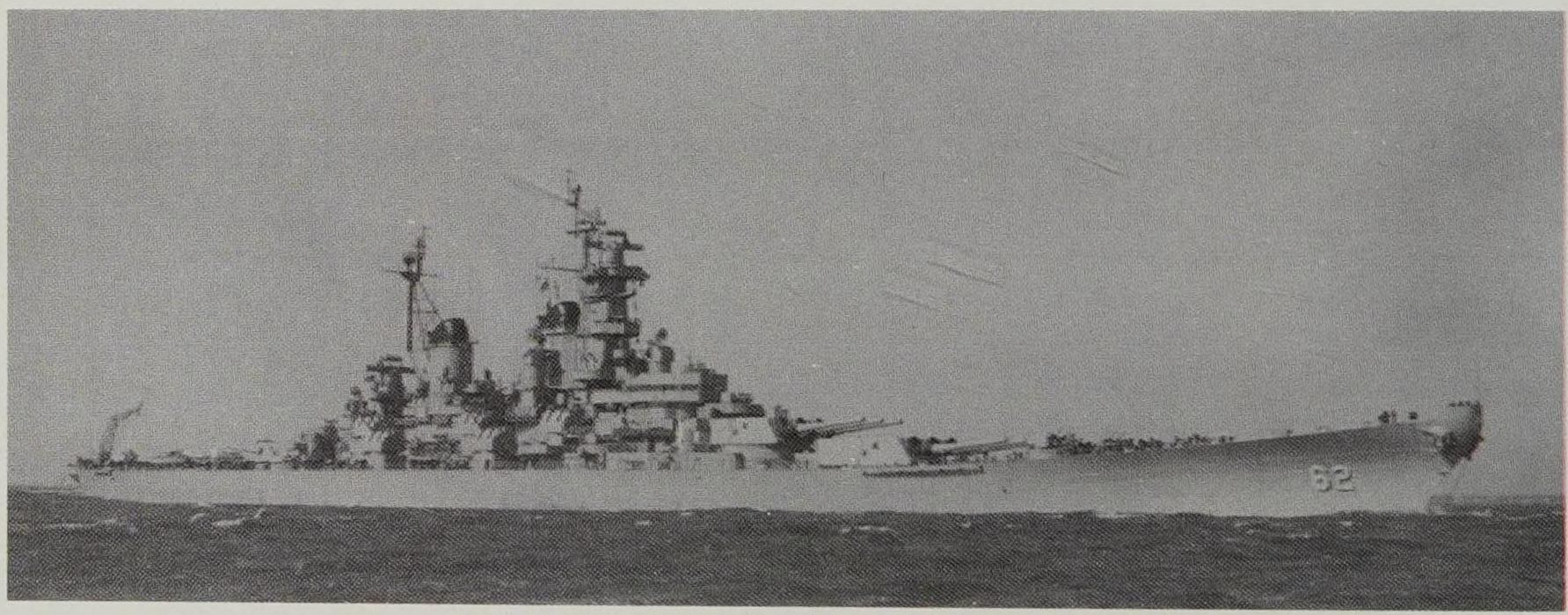


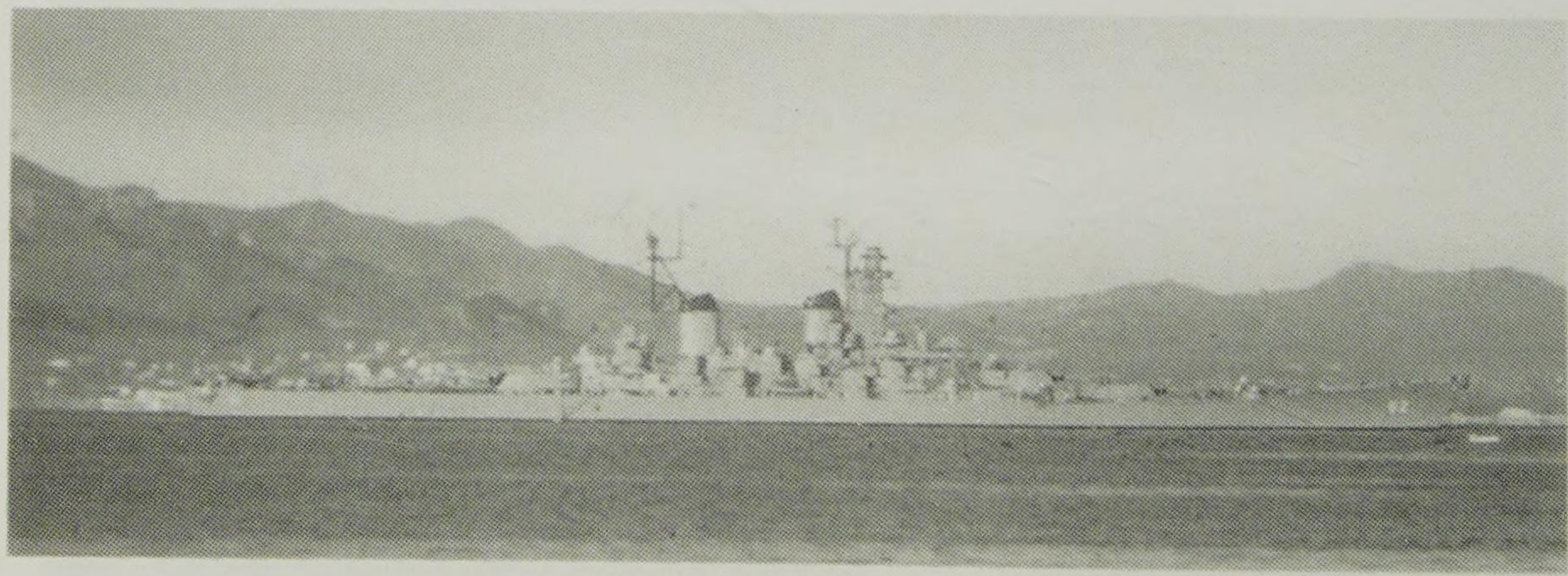


Above: 30 Dec 1945 Tokyo Bay Japan. As BB62 was undergoing overhaul at the time of the surrender and arrived in Japan in Oct 1945 to relieve BB61. BB62 performed occupation duty until 18 Jan 1946. In the background is Japanese BB Nagato under USN administration. Nagato transited from Japan to Bikini Atoll under ship's power in Jun 1946.

Left: 3 Nov 1950 Bayonne NJ. BB62 undergoing reactivacation for Korean Duty. Note the small and faded hull number. During BB62's post Korea Tour yard period BB62 had the overhang on the bow gun tub removed as did the BB64 in 1954 and on the BB63 in 1953. BB64 regained the overhang when the ship's bow was repaired with the BB66's bow in Apr 1956. BB61 retained the bow tub overhang to the present (2008).

Right: Circa 1952 Atlantic Ocean. BB62 at sea is illustrative of the 1950-54 appearance of the BB61-BB63. Note the Mk25 FC radars atop the Mk37 DP directors, and the retention of the cantilevered mainmast topped with an SP2 radar. Catapults have been removed and the ship's boats are stored on the fantail which is also now used to support helicopter operations.





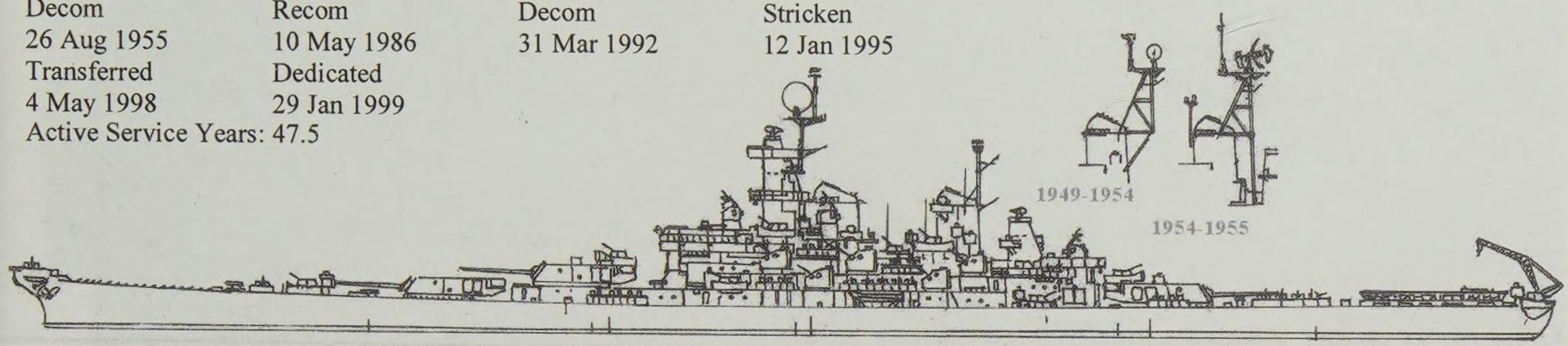
Left: 22 Oct 1955 entering Phalaran Bay Greece. BB62 remained at Phalaran until getting underway on 27 Oct for Athens. BB61 class ships routinely deployed to the Mediterranean with the 6th fleet during the early Cold War era. Note the lattice mainmast topped with an AN/SPS8A.

Battleship USS Missouri BB63 Call Letters: **NCBL**

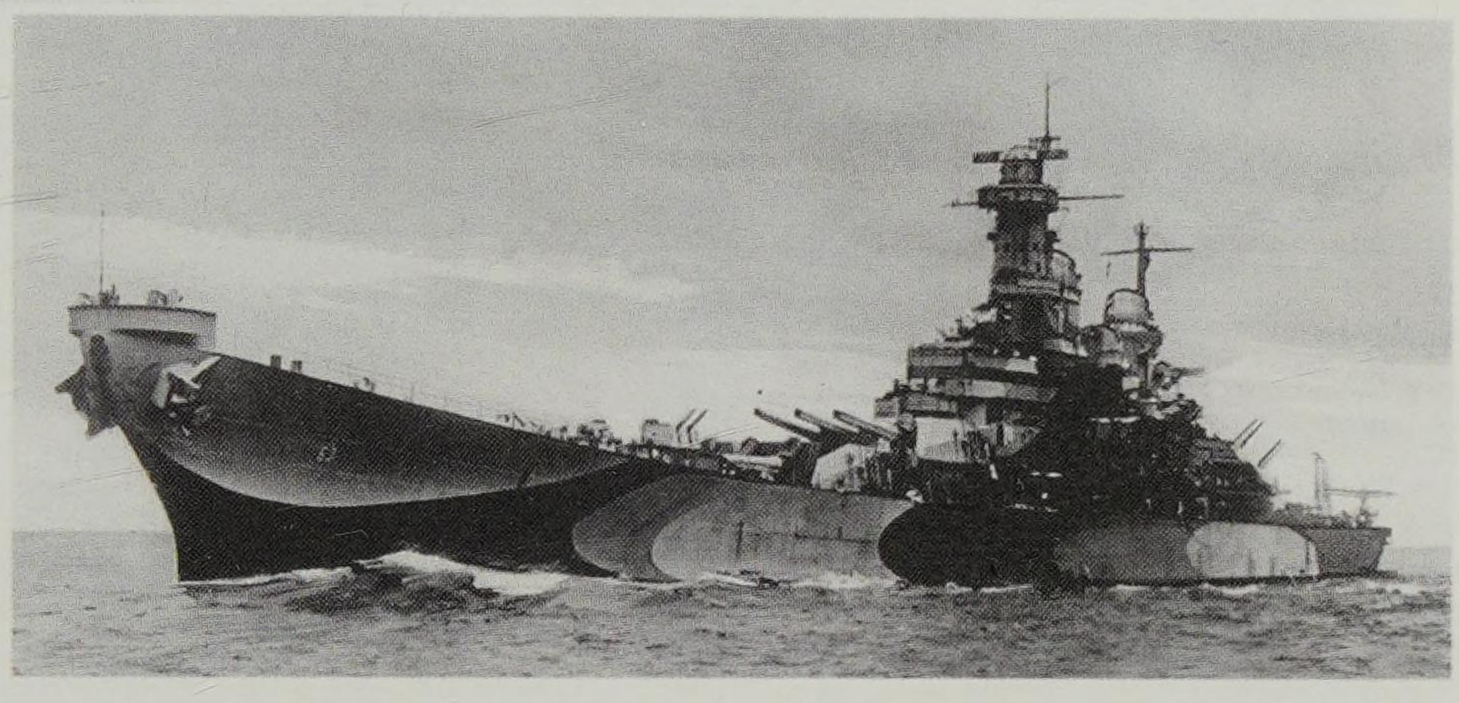
Builders Yard	New York NSY Brooklyn NY
Reserve Group	1955-1984 Bremerton NSY WA
Reserve Group	1992-1998 Bremerton NSY WA
Scrapping Yard	-
Museum Location	Pearl Harbor HI

Ordered	Keel Laid	Launched	1st Comm
12 Jun 40	6 Jan 1941	29 Jan 1944	11 Jun 1944
Decom	Recom	Decom	Stricken
26 Aug 1955	10 May 1986	31 Mar 1992	12 Jan 1995
Transferred	Dedicated		
4 May 1998	29 Jan 1999		

Active Service Years: 47.5



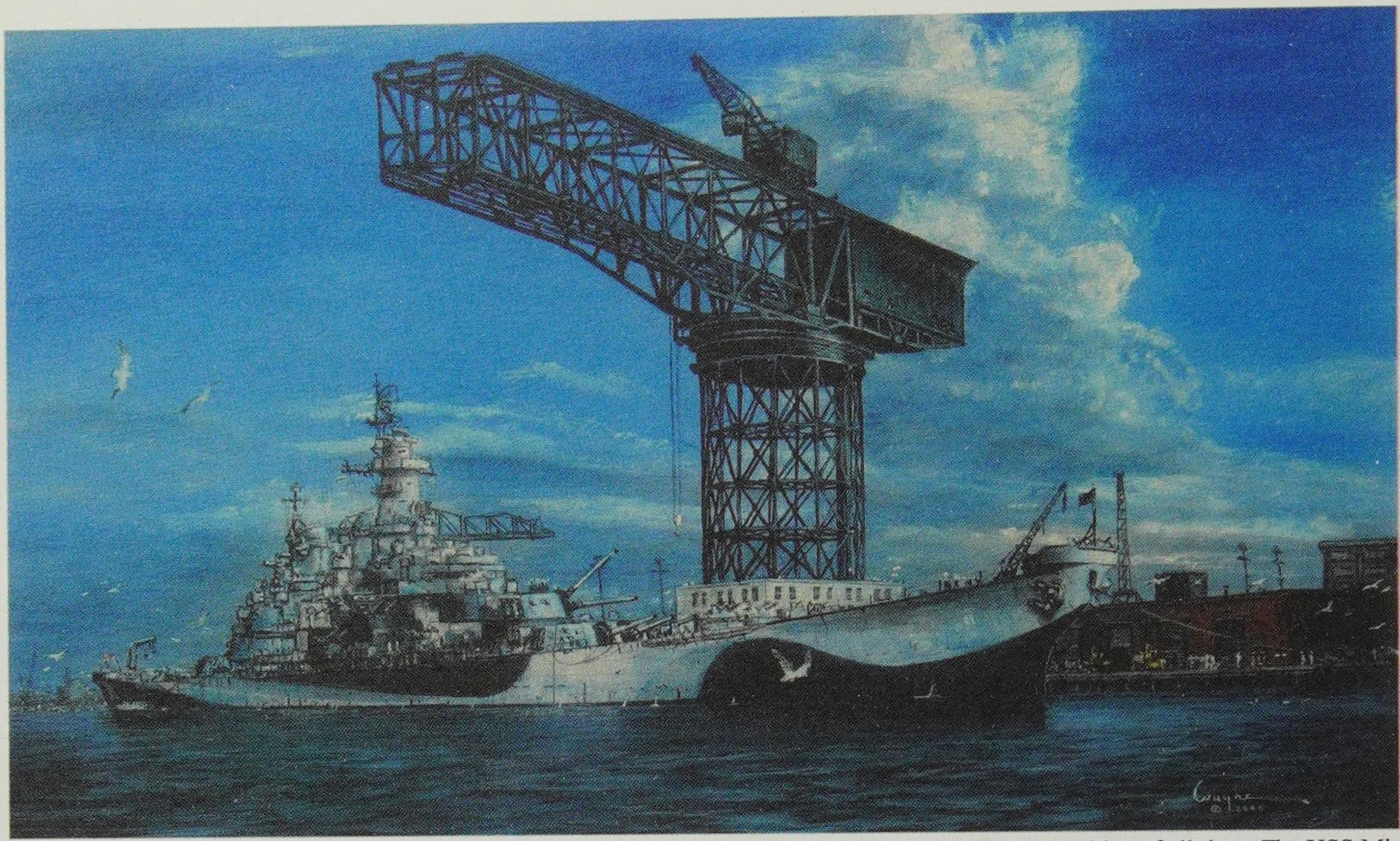
USS Missouri BB63 Aug 1944 Ms32/22d



Right: Circa Aug 1944 off the NyNSY. BB63 on shakedown. The ship is shown in a photograph intended for public release and/or publication. Notice that all evidence of radars have been airbrushed out by a censor. Photos of USN ships that did not have radars censored out were classified as "Restricted: Not for Publication" during WWII. BB63 is underway on builder's trials. Paint is Ms32/22d.

Right: 27 Aug 1945 Sagami Wan. USS Missouri BB63 in a photograph that symbolizes "Victory at Sea" for the USN. BB63 is anchored in Sagami Wan outside Tokyo Bay with Mt Fujiyama in the background. On 29 Aug 1945 BB63 with the other ships of TF35 moved into Tokyo Bay in preparation for the surrender ceremony on 2 Sep 1945. Paint is the Ms22 BB63 wore from leaving Hunters Point, where the ship's Ms32/22d had been replaced with Ms22. BB63 carried Ms22 until 27 Sep 1945 when the ship was repainted to the relatively rare Ms18. Ms18 was an all Navy Blue hull with Haze Gray upperworks.

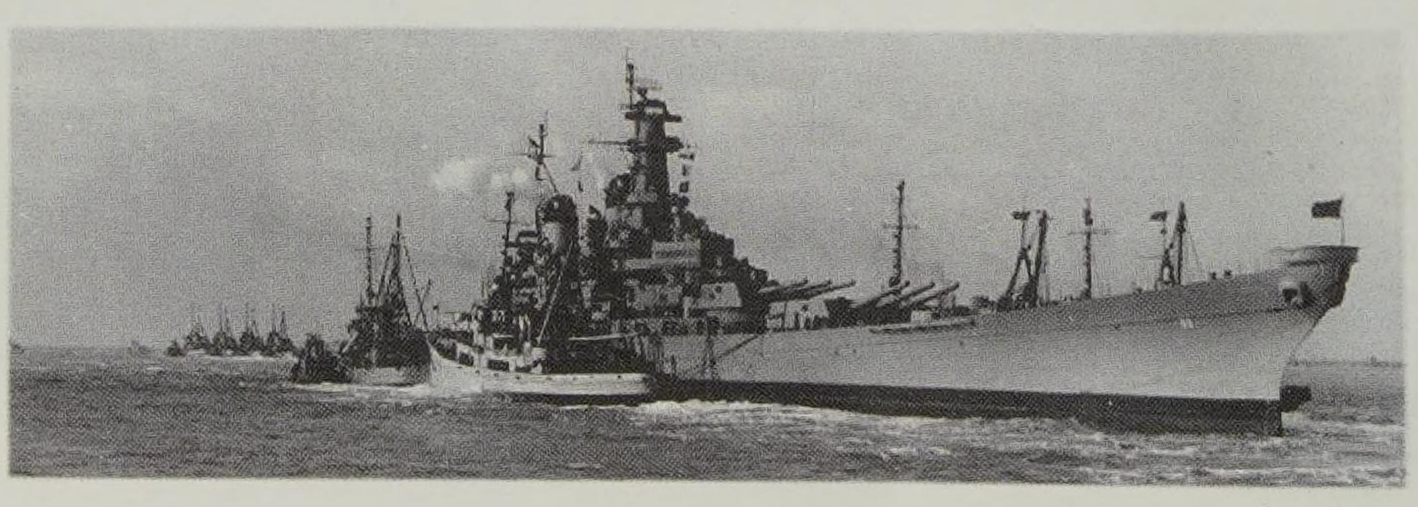
29 Sep 1945 Pearl Harbor Hi. With the surrender ceremonies complete BB63 was rushed to the East Coast. The ship is departing for New York City and the 27 Oct 1945 Navy Day Presidential Review on the Hudson River. BB63 is in the Ms18 paint received at Pearl Harbor. During the ship's stay at Pearl Harbor, the Deck Blue paint was removed from the teak decks and Holystoned to perfection. Paint was also stripped off the brass "bright work" and polished to a prewar gleam.



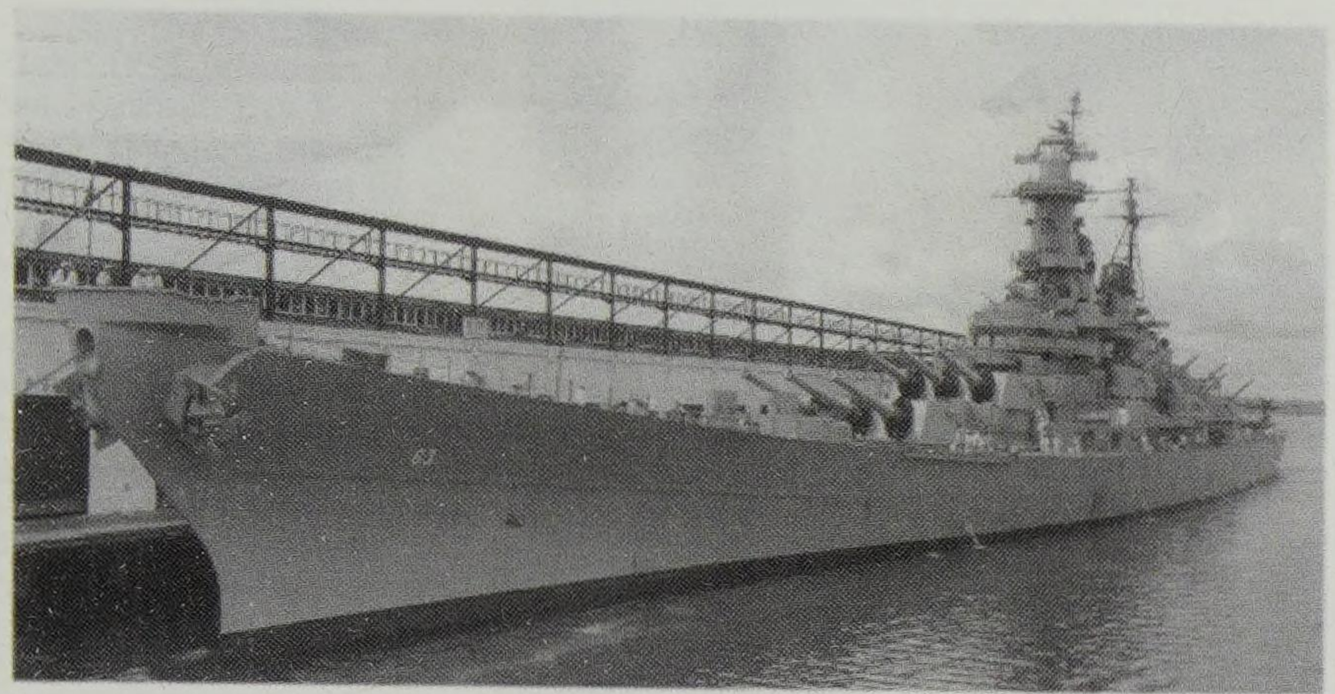
USS Missouri BB63 New York Naval Ship Yard Aug 1944. One of the most famous, and well publicized warships of all time. The USS Missouri became a household name in September 1945.When while anchored in Tokyo Bay Japan, the ship did witness on the morning of 2 September 1945 the signing of the formal surrender documents that ended WWII. The ship is moored under the massive 'hammerhead crane' at the New York Shipyard where the ship has been fitted out. The ship has returned from initial sea trials and is receiving minor repairs and adjustments prior to starting her full shakedown cruise. Missouri is painted a camouflage pattern hurried designed expressedly for the BB63 at the request of then Senator Truman. The scheme selected was a striking Measure 32/22d camouflage comprised of a graceful pattern of lines and curves comprised of Dull Black, Ocean Gray, and Haze Gray. In 1939 the then senior Missouri Senator Truman was extremely instrumental in the selection of the name Missouri for BB63. Senator Truman's daughter was awarded the honor of christening the ship at her launching in 1942. In Aug 1945 President Truman had also been very influential in the selection of the Missouri as the site for the formal surrender ceremony. Thus assuring BB63 of a permanent berth in the annals of history. President Truman in the postwar years of his term maintained a personal interest in the career of the Missouri, helping to insure that the Navy's sole active battleship by 1949 was the USS Missouri.

Above: 27 Oct 1945 Hudson River New York City. BB63 with President Truman embarked. BB63 transported President Truman and Family on a cruise to Rio de Janeiro Brazil and return in Sep 1947. Note the USS Renshaw DD499 alongside. Paint is Ms18 BB63 wore Sep 1945-Jan 1947.

10 May 1946 Norfolk NSY. BB63 loading stores. Note most of the 20mm battery has been landed to reduce manning requirements. The ship is preparing to participate in 8th Fleet exercises off the East Coast.

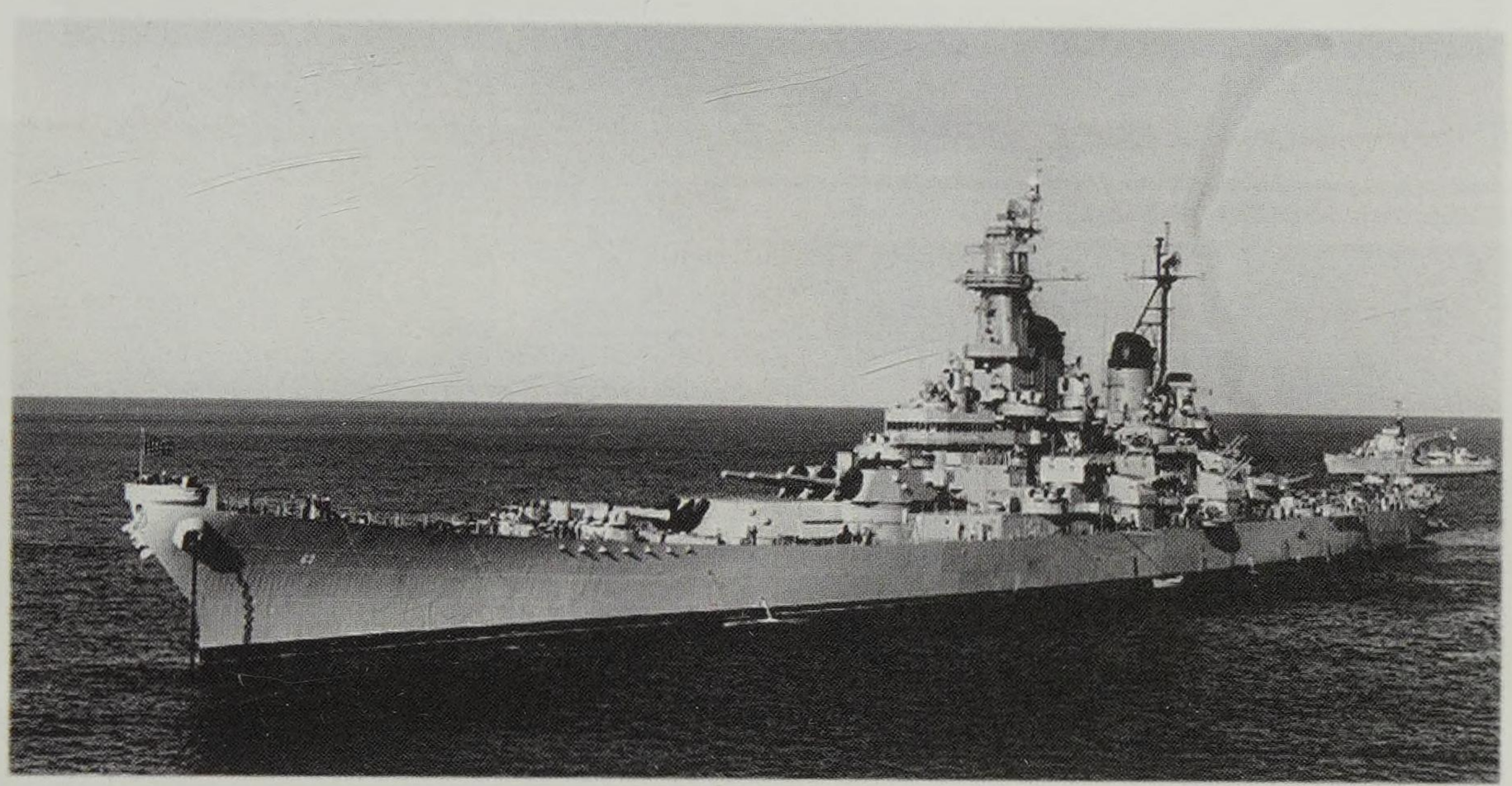


Left: 1 Feb 1950 Thimble Shoals near Norfolk NSY VA. Attempt to free BB63 in light ship condition after grounding on 17 Jan 1950. BB63's salvage was the largest peacetime USN salvage operation. It was necessary to off load ammunition, supplies, and fuel to reduce the draft enough to free the ship. Damage to BB63 was minimal. And no rumored speed limitations were ever imposed on BB63 as a result of the grounding. Note the cantilevered mainmast and the small hull numbers.



Circa Jul 1950 Cristobal, on the Atlantic side of the Panama Canal Zone. BB63 is moored pierside while en route to the Korean Theater. BB63 was one of the first heavy ships to arrive in Korean waters after the invasion. Battleship fire support was considered invaluable by ground forces during both WWII and Korea.

Right: 25 Oct 1950 off Wonsan, North Korea. BB63 anchored in preparation to commencing precision fire support. It was common practice for UN ships conducting shore bombardment missions during the Korean Conflict to drop anchor. This was done to increase the accuracy and consistency of the fire support. The practice of anchor UN ships off enemy held coastlines was only possible due to absolute air and sea superiority the UN forces had achieved.



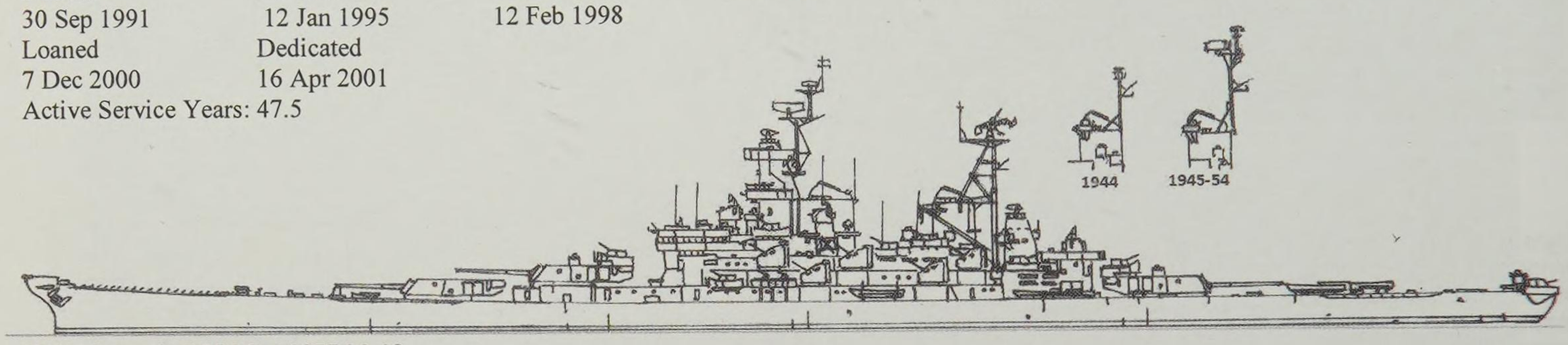
Left: 23 Aug 1954 Norfolk NSY. BB63 departing for transit to Puget Sound NSY to commence the deactivacation process. This is BB63's final postwar configuration prior to decommissioning in Aug 1955. Note the 4 legged mainmast with an AN/SPS8A Height Finder. BB63 became a major tourist destination while in reserve at Bremerton 1955-1980. When the USN announced the release of BB63 from the NVR in the 1990's. The City of Bremerton made a bid to have the ship again enshrined as a memorial to be located at Bremerton. But the USN made the decision to move BB63 to Pearl Harbor. Where the ship was moored at quay Fox7, just ahead of the USS Arizona BB39 memorial. Together the ships represent the summation of the War in the Pacific. BB39 is where WWII for the US began and BB63 is where it ended.

Battleship Wisconsin BB64 Call Letters: **NUGW**

Builders Yard	Philadelphia NSY PA
Reserve Group	1958-1962 Bayonne Naval Annex NJ
Reserve Group	1962-1984 Philadelphia NSY Pa
Reserve Group	1991-1996 Philadelphia NSY Pa
Reserve Group	1996-2000 Norfolk NSY VA
Scrapping Yard	-
Museum Location	Norfolk VA

Ordered	Keel Laid	Launched	1st Comm
12 Jun 40	25 Jan 1942	7 Dec 1943	16 Apr 1944
Decom	Recom	Decom	Recom
1 Jul 1948	3 Mar 1951	8 Mar 1958	1 Aug 1986
Decom	Stricken	Reinstated	Stricken
30 Sep 1991	12 Jan 1995	12 Feb 1998	
Loaned	Dedicated		
7 Dec 2000	16 Apr 2001		

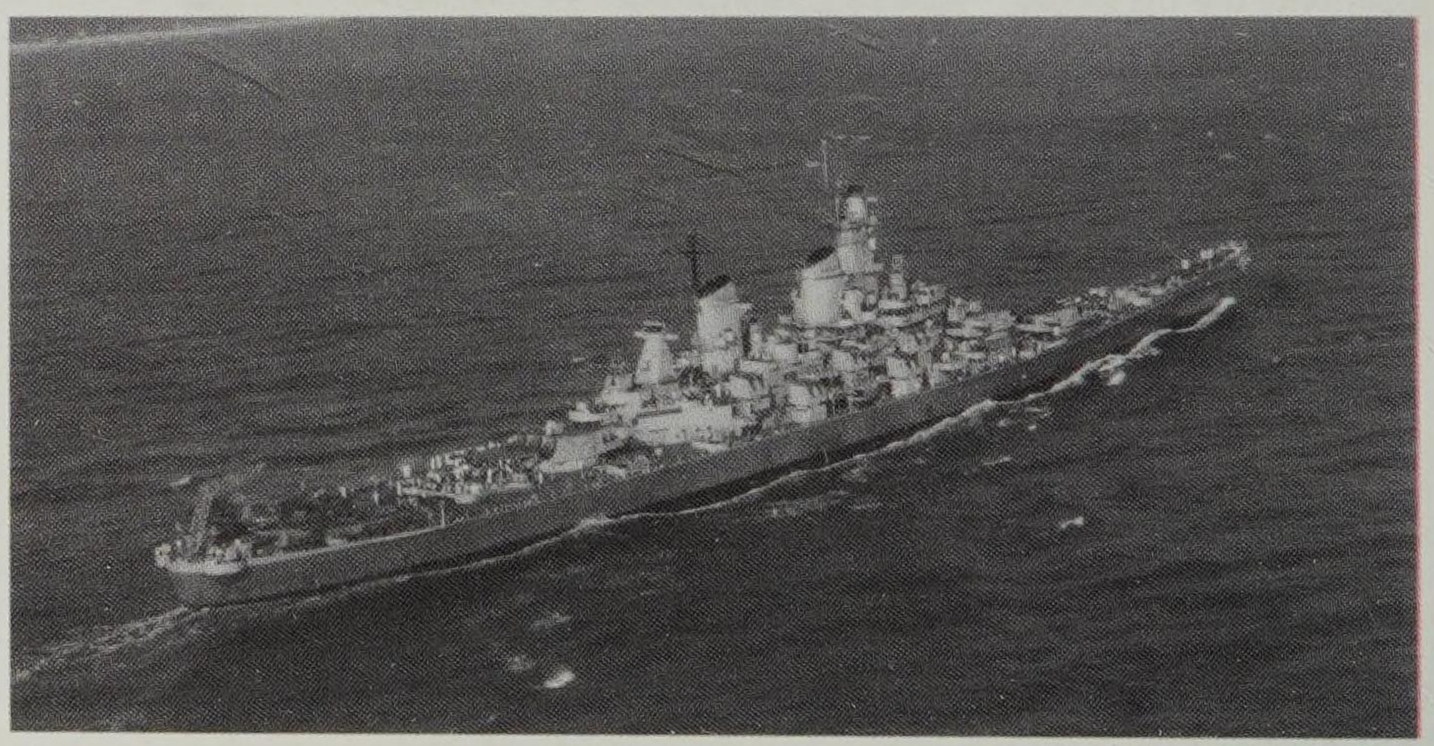
Active Service Years: 47.5

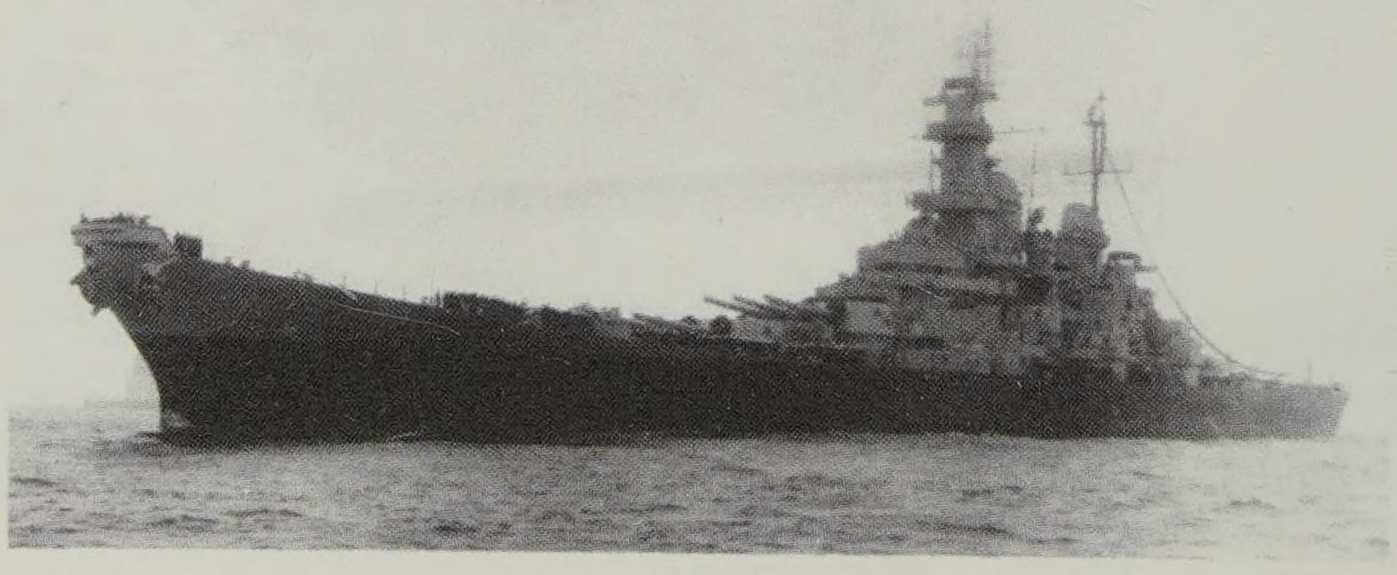


USS Wisconsin BB64 Oct 1957 Ms13

Left: circa Mar 1944. BB64 on builder's trials off PhNSY. The ship is not flying the National Ensign, which indicates it is not yet commissioned. BB64 is also in light displacement, which indicates no ammunition is aboard.

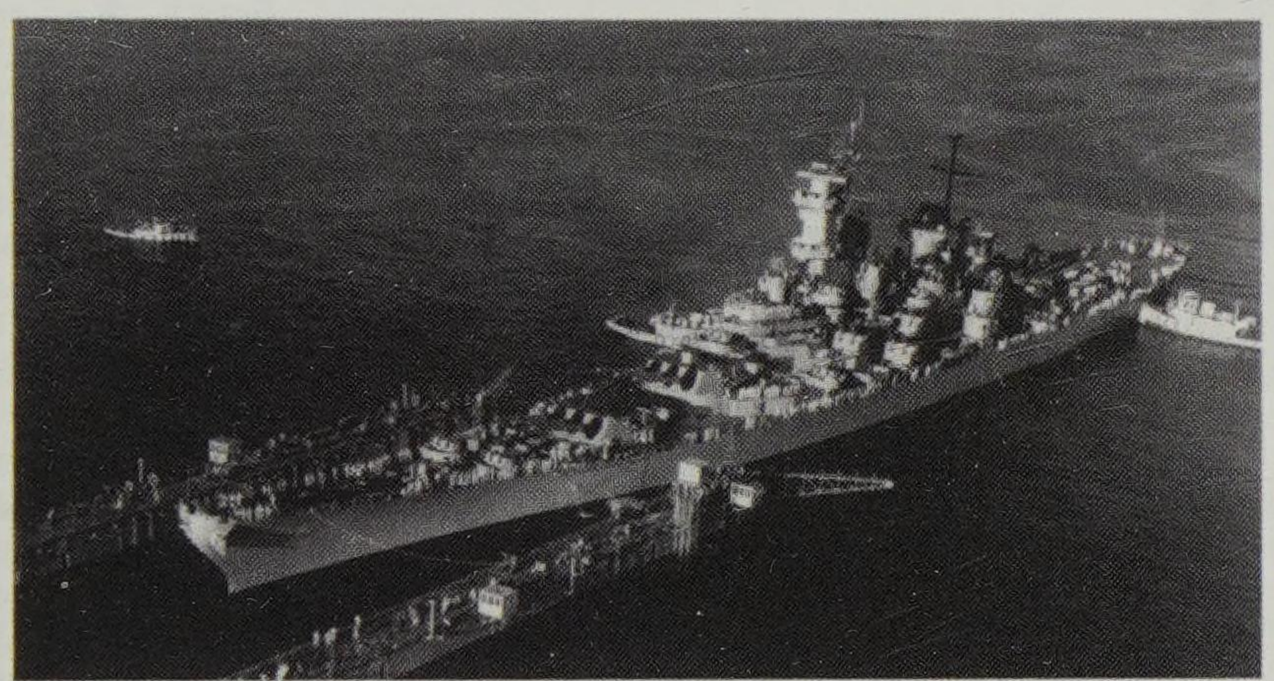
Right: Circa Apr 1944 BB64 off the East Coast on builders trials. Note the short mainmast topped with an SG set as in the BB61-BB63. BB64 had the mainmast extended and an SC2 set added during post shakedown yard period. BB61 had a similar mainmast arrangement added in Jan 1945. BB62 and BB63 never shipped the extended pole mainmast.





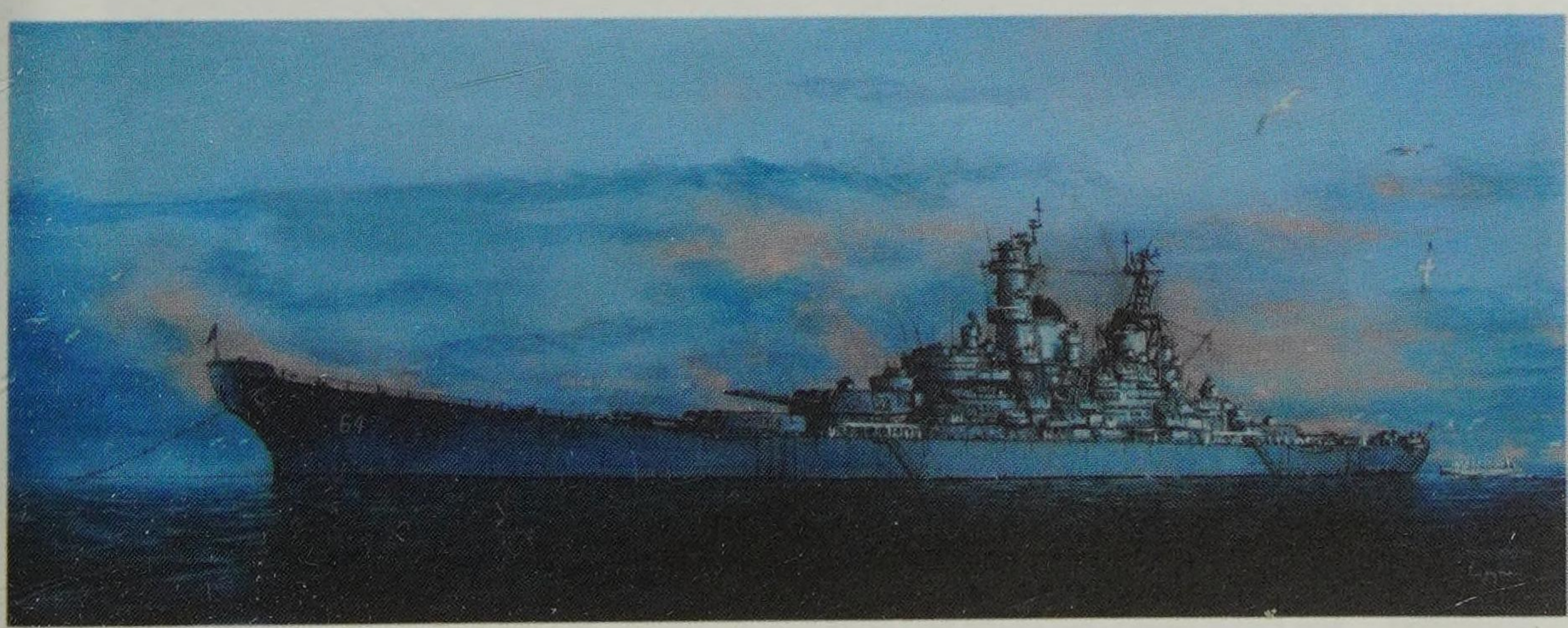
Left: 15 Oct 1945 San Francisco Bay. BB64 arriving from the Pacific Theater on a foggy day flying the ship's homeward bound pennant, for which each foot of length represented 1 day of overseas duty. The ship is painted Ms22 which BB64 commissioned in and carried for the duration of WWII.

Right: USS Wisconsin BB64 San Francisco Bay Sep 1944. BB64 steaming towards the Golden Gate outbound for the Pacific Theater. Due to a series of hydrodynamic issues the BB61 class battleships, which were the most maneuverable battleships ever built, tended to handle very poorly at low speeds and/or in shallow water. They therefore almost always had an entourage of tugs standing by to assist with any maneuvering issues.



Left: 5 Apr 1952 ASBD1 Apra Harbor Guam. BB64 entering the drydock to participating in a heavy ship lifting exercise. Positioning a ship in a floating drydock called for precision positioning requiring surveyor's transits to avoid destabilizing the ship or the drydock during the lift process. Note retention of the extended pole mainmast. BB64 never shipped the cantilevered mainmast as did BB61-BB63.

Right: Jul 1954 off Norfolk NSY. BB64 after the completion of overhaul. Notice the single Kingpost abaft the after starboard leg of the mainmast and the retention of the aircraft crane aft. In 1955 the BB64 had the full kingpost arrangement added, the aircraft crane and the forward 40mm's on the forecastle removed. BB64 did not receive the Mk56 AA directors as did BB61 and BB62 but retained the WWII era Mk57's. By the late 1950's the 40mm batteries on the BB61 class were consider obsolete and ineffectual against modern jet aircraft.

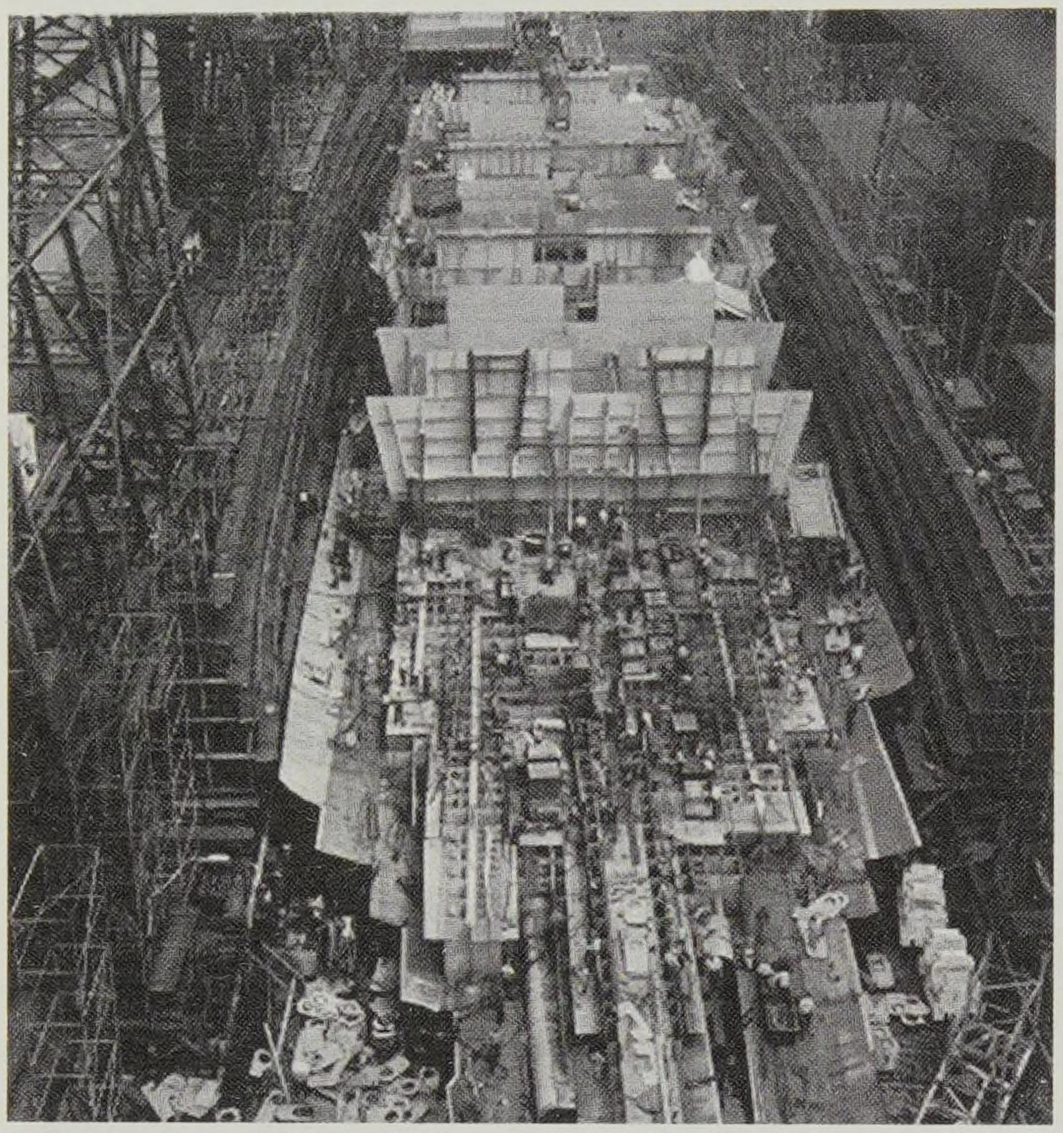


The USS Wisconsin BB 64 off Havana Harbor Cuba Oct 1957. After the end of the Korean War the Iowa's conducted training cruises, participated in NATO exercises, and on 'showing the flag' cruises. Often the mere presence of a BB was enough to deter Communist aggression during the darkest days of the Cold War. After returning from this cruise BB64 reported to Bayonne Naval Annex for deactivation. BB64 was placed out of commission on 4 March 1958 leaving the USN without an active battleship type for the first time in 62 years.

Battleship USS Illinois BB65 (Canceled)

Builders Yard		Philadelphia NSY PA	
Scrapping Yard		Steel Scrap Co Philadelphia PA	
Ordered	Keel Laid	Canceled	Scrapped
9 Sep 1940	15 Jan 45	12 Aug 1945	Sep-Nov 1958

Note the ship was cancelled when 22.7% complete prior to launch. The unfinished hull remained on the builder's ways for 12 years.



7 Jul 1945 PhNSY. BB65 under construction. BB65 and BB66 were considered for a redesign according to a memorandum from FADM King to FADM Nimitz in 1945 recommending redesigning the ship's parameters as below :

An increased in side protection similar to the BB67 class.

Addition of torpedo blisters.

Deletion of the conning tower, with a bridge similar to rebuilt BB43 class.

Addition of superfiring 5"/38 twin mounts above turrets 2 and 3.

Uptakes routed into a single stack similar to the BB57 class.

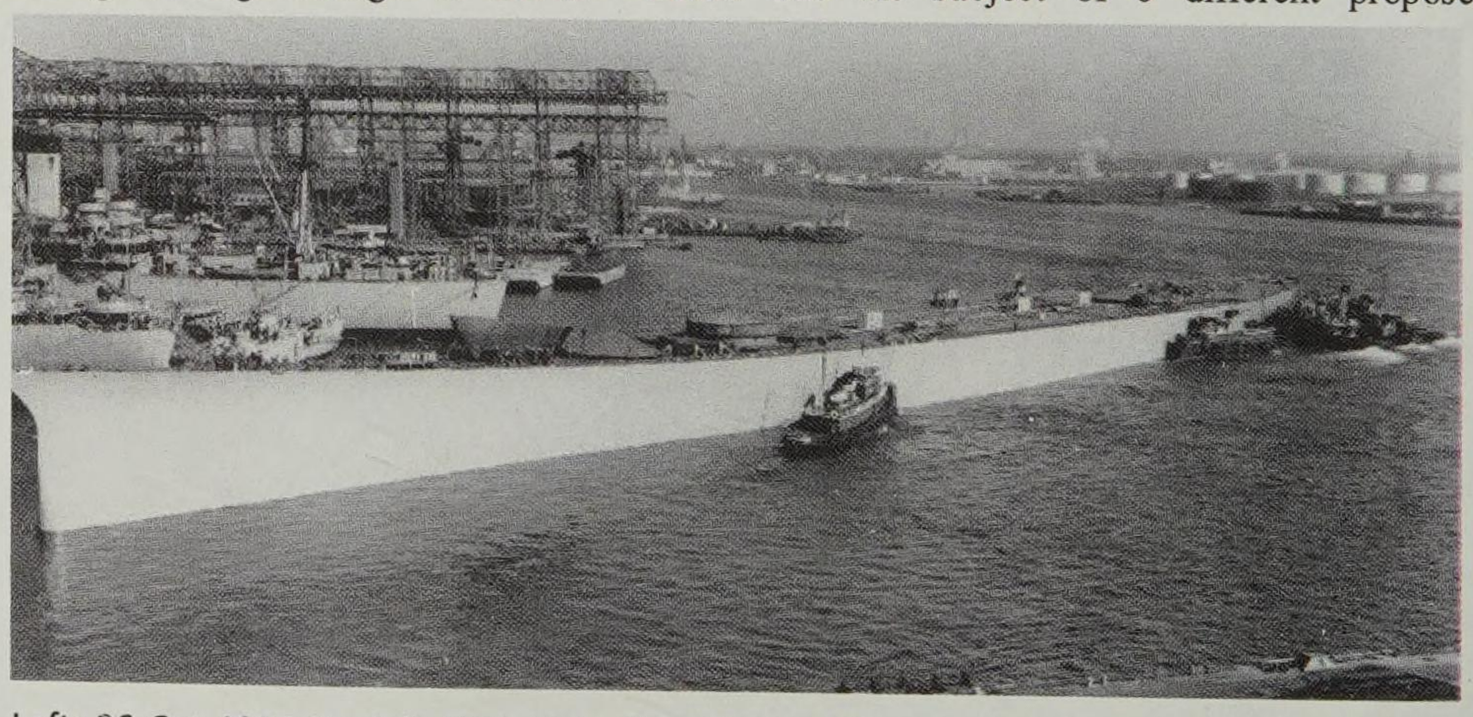
No action was apparently taken on these recommendations to accomplish the redesign, as both ships remained suspended. FADM King supported continued postwar construction of BB types. FADM King viewed the fast BB to be an essential component of the fast CV striking force. As late as the mid 1950's the USN was still considering completion of BB65 and BB66 as 'all gun' ships. Thus BB65 remained on the ways until 1958 and BB66 remained in storage until 1958.

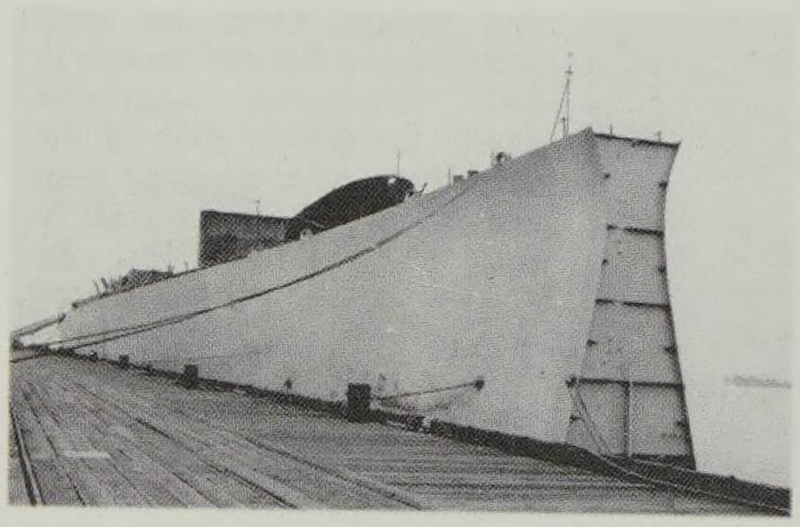
Battleship USS Kentucky BB66 (BBG1) (Canceled)

Builders Yard		Norfolk NSY Portsmouth VA		
Reserve Group		Norfolk NSY VA		
Scrapping Yard		Boston Metal Co Baltimore ND		
Ordered	Keel Laid	Launched	Keel Re-laid	
9 Sep 1940	7 Dec 1942	7 Jun 1942	12 Dec 1944	
2nd Launch	Canceled	Stricken	Sold	Scrapped
20 Jan 1950	12 Aug 1945	9 Jun 1958	31 Oct 1958	Dec 1958

Notes: Construction was originally started in Jan 1942 on a building way at Philadelphia NSY. The unfinished hull section was "launched' 7 Jun 1942 and stored at PhNSY. Then transferred in Dec 1944 to a drydock at Norfolk NSY for completion prior to official launching. The projected rescheduled (1944) delivery date was 1 May 1946. Work on the ship was again suspended in 1948. On 20 Jan 1950 the hull was floated out (launched) to clear drydock for use repairing the grounding damage to BB63. BB66 was the subject of 6 different proposed BB(AA)/BBG/BBMG conversions 1946-1958.

Right: 20 Jan 1950 Norfolk NSY. BB66 (72.9% complete) is floated out of her building dock. BB66's hull bottom had been launched off the original building ways at PhNSY on 7 Jun 1942. Then docked and restarted in a graving drydock at Norfolk. BB66 was the only USN BB to have 2 "launchings".





Left: 26 Oct 1956 Norfolk NSY. Note the missing 68' section of bow that was removed in Jun1956 to repair BB64. BB66 was the subject of 5 missile ship conversion proposals from 1947 to 1958. 1 conversion into a single ended Terrier armed BBG similar in concept to the Boston class CAG's. Two versions of a Guided Missile Monitor (BBMG) armed with modified Jupiter IRBM's with Talos and Tartar SAM's. Two for a MACK guided missile conversions (BBG) armed with initially with Regulus, and later with Polaris IRBM's, equipped with Talos and Tartar SAM's. But in the end none was authorized and the hull of BB66 was scrapped.

Montana Class: 5 (canceled) Battleships of 1940:

USS Montana BB 67 Ohio BB 68 USS Maine BB6 9 USS New Hampshire BB 70 USS Louisiana BB 71

The fourth 3rd generation and the final USN battleship design. The BB67 class ships were the end product of a long line of evolutionary design processes. They were the first USN design free of the constraints of the provisions of Washington Naval Treaty. Main armament was increased by mounting an additional triple 16" turret aft for a total count of 12 16"/50's. The secondary armament was also upgraded with the introduction of the improved 5"/54 in 10 twin mounts. The BB67's were the first design to provide adequate armor protection against 16/50" Mk7 gunfire. The BB67 class on a 52,000 ton standard displacement were the first USN battleship design to exceed (120' vs. 108') beam dimensions requirements for transiting the Panama Canal whose lock basins are 112' wide. This limitation was accepted in order to achieve the improved side protection. Their designed speed requirement was lower back to 28 knts (the same performance profile as the BB55 and BB57 classes thus providing a 28 knot main body to the battlefleet). It had been determined that a further 30% increase in power output for a 33knt design would have resulted in increasing the waterline length to over 1000' (1067' wl length in one 33knt design study). Which exceeded the dimensions of most drydocks and USN Base infrastructure at the time.

Ascetically the BB67 class ships would have strongly resembled the preceding BB61 class, with the addition of a second main turret aft. There was a reversion of the secondary armament lower back on the maindeck 01 level and the 02 level, as in the BB55 class. With four mounts on the maindeck and six mounts on the 02 level. A long sweeping single level maindeck, a clean hull with no portholes and an external armor belt, and a slightly more extremely raked Iowa type bow with the same type of bulbous top were incorporated. The design shipped twin stacks with the forward stack flared into the after portion of the foreword superstructure. An overall lowering of the superstructure silhouette was possible due to the lower of the mounting locations of the secondary battery. Aircraft handling facilities were comprised of the standard 2 catapults and a medium duty crane on the fantail.

The 5 ship BB67 class were ordered as part of the 'Two Ocean Navy Act" in Sep 1940. It was intended the keels for the first two ships to be laid on 4 Jul 1941 in large graving docks rather than on building ways. However, their construction was assigned a low priority, in order to make materials and construction space available for the building of escorts and landing vessels, which were urgently required at the time. The keel layings were at first deferred, and finally canceled in 1943. The docks that had been scheduled for the construction of the BB67's were reallocated to the construction of the 3 Midway class CVB's The bulk of Montana class ship's materials, and the intended secondary batteries of 5"/54 guns were diverted to and incorporated into the Midway class CVB's. The guns barrels for the BB67 class were manufactured and stored at Norfolk NSY and were used on the BB61 class ships during their 1980's active period.

The BB67 class design was intended to counter, what at the time was believed to a 45,000 ton 16" armed Japanese BB class. The actual Yamato class BB's displaced 72,000 tons and mounted 9 18"/47's making them much more powerful ships than BB67's designers envisaged having to defeat. However, results of postwar tests and evaluations of the Japanese 18"/47 against armor plate of the BB61 class and the effect of the 16"/50 Mk7 against the armor plate of the Yamato class, showed the high velocity USN 16" piece to be capable of piercing Yamato's armor at normal battleranges while the Japanese piece was incapable of defeating Montana style armor at the same ranges. This coupled with the superiority of USN firecontrol and machinery systems suggests the Montana class would have probably emerged the victor in Yamato/Montana engagement. However, had the USN had completed these ships they probably would not have remained long in active service in the postwar fleet. Due largely to the design's inherent speed limitations which would have restricted their effective operations with the fast (33knt) carrier groups.

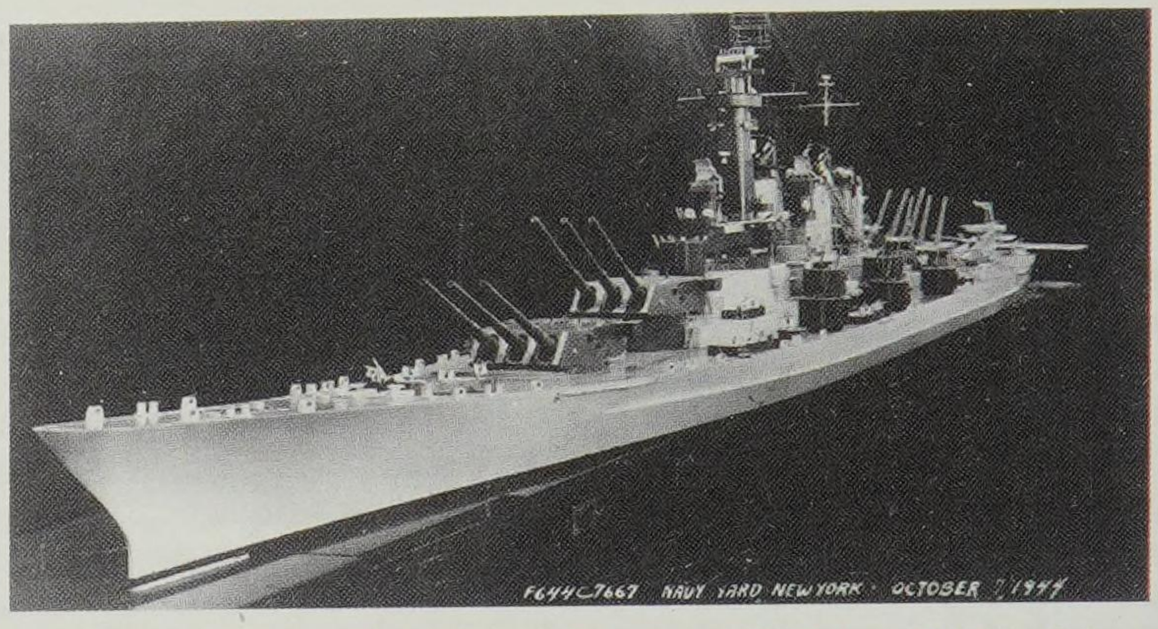
Montana Class Battleships Statistics 1943 final redesign

Displacement	Std/FL Designed	65,000 tons/68,317 tons
Dimensions	Length WL/OA/Beam	890'0"/921'3"/115'0"
	Draught (max)	36' 0"
Machinery	Type	4 Geared Turbines
	Boilers	8 (oil fired) 615psi 850F
	Shafts/designed SHP	4 shafts 172,000 shp nominal
	Rudder	single
	Max Designed Speed	28.0 knts
	Weight of Eng Plnt	4,738
	Fuel bunkerage/Range	7,500tons/15,000 nm @15.0kns
	GM	8.20
Armament:	Weight of Broadside	32,400 Lbs/16.2 tons
	Projectile Weight	2,700lbs/1.35tons
	Max range	42,345yds/24.0 miles
	Rnds/Weight per Min	2.0/32.4 tons
	Rnds per gun/Total Rnds	130/1,560
	Main	12-16"/50
	Sec	20-5"/38
	AA	60-40mm 46-20mm
Protection:	Main (wl) Belt/Incline	16.1" +1.5"/19°
	Deck	9.92"/3 decks
	Turret	18.0" face 10"side 12"top 10"back
	Total Armor Weight	15,538 tons (min)
Catapults/Aircraft	2 Cats/4 Aircraft	

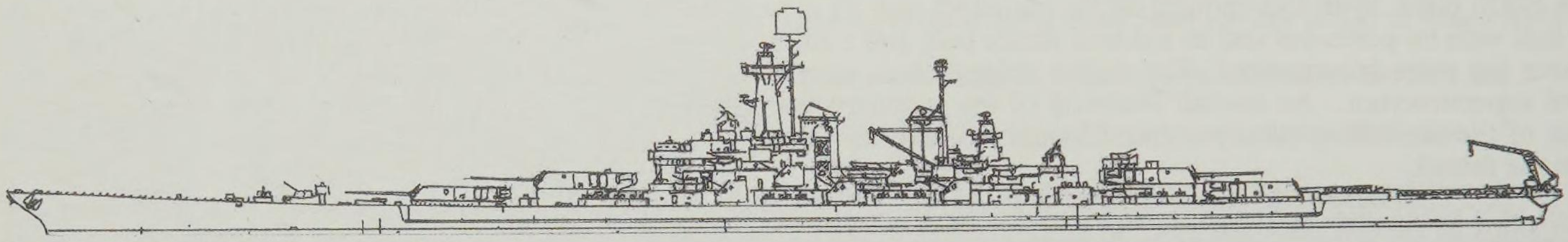
BB67 class chronology

Ordered:	Canceled
9 Sep 1940	21 Jul 1943

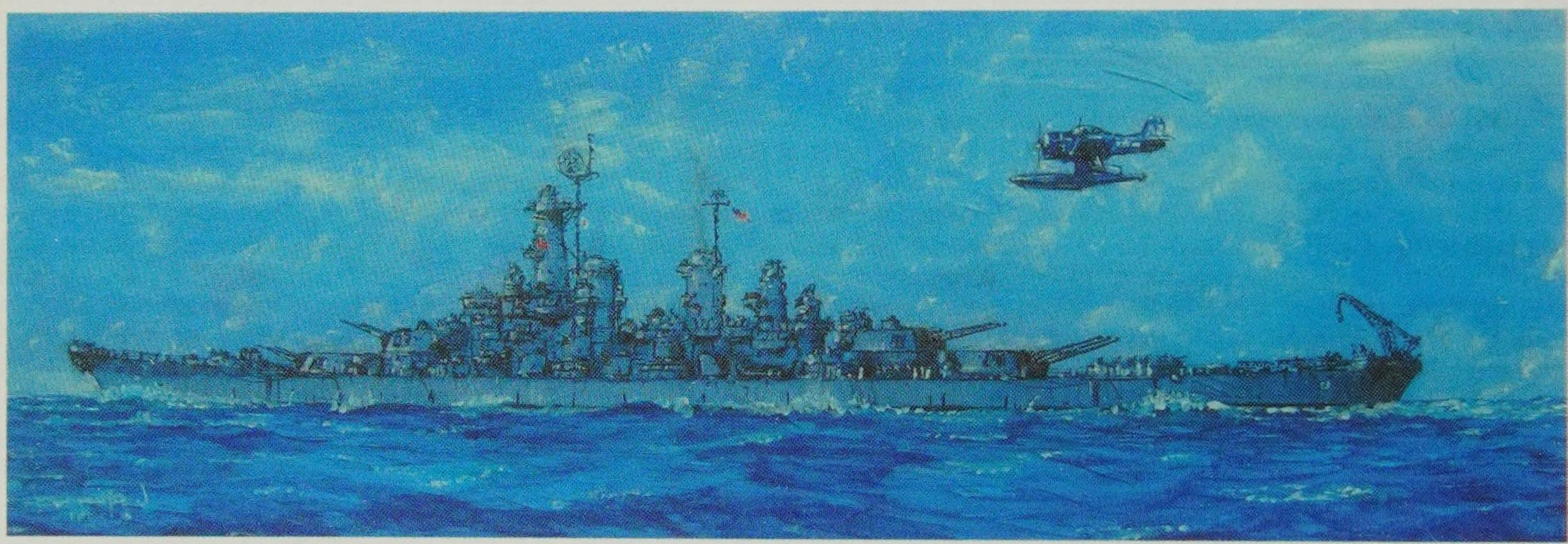
Name	Hull No.	Builders Yard
Montana	BB67	Philadelphia NSY
Ohio	BB68	Philadelphia NSY
Maine	BB69	New York NSY
New Hampshire	BB70	New York NSY
Louisiana	BB71	Norfolk NSY



Above: 7 Oct 1944 New York NSY USS Montana BB67 class 1943 final design. This photograph is interesting inasmuch as it was taken after the BB67 class had been cancelled over a year earlier.



USS Montana BB67 final design Aug 1943.



Above: **"The Last BB's"** Illustrative of the canceled USS Montana BB67 at sea in late 1945. The aircraft is an SC1 Seahawk. Note the low silhouette 4th turret aft. Paint is Ms21.

Right: Speculation Only. BB67 arriving in New York Harbor after the invasion and defeat of Japan. The ship has FADM Nimitz embarked aboard as flagship of the US Pacific Fleet. Paint is Ms 22.

Alaska Class Large Cruisers: 6 ships of 1940:

USS Alaska CB 1 USS Guam CB 2

(USS Hawaii CB 3 USS Philippines CB 4 USS Puerto Rico CB 5 USS Samoa CB 6 canceled)

The only class of USN battlecruiser design to be completed. While the USN officially designated the Alaska class ships as 'Large Cruisers'. This was presumably to avoid connecting them with the inadequately protected foreign (particularly UK CC) designs of WWI. It remains that the CB1 class ships were in fact battlecruisers by both definition and concept. Within the context of the term 'Battlecruiser' being defined as a vessel of battleship dimensions that sacrifices firepower, and/or armor protection in order to reduce weight. Permitting the installation of a more powerful engineering plant, thereby achieving higher speeds. Battlecruisers are designed to be primarily deployed to engage and defeat enemy heavy and light cruisers. Battlecruisers were also intended to provide a fast reconnaissance force to the battlefleet. From 1933 onwards the CB type was also intended to provide the ability to pursue, and destroy a new type of warship, the German Panzerschiffen 'pocket battleship' type (11,000 ton armored cruisers with 6 11"guns, 26kns speed, protected against 8"gunfire) intended to operate independently as surface commerce raiders. By 1938 France was constructing the 2 Dunkerque class CB's of 26,000 tons with 8 13" guns and a 29.5 kns speed as 'replies' to counter the German ships. At the time of the CB1's inception the USN did not have any types of ships that were capable of successfully pursuing, engaging, and defeating 'pocket battleship' types. In addition, during 1940/1941 USN Intelligence Sources received indications that the Japanese Navy also had under construction a class of a similar type of commerce raiders. These were the non-existent, but repeatedly reported, 'Chichibu class' of pocket battleships/battlecruisers, 4-6 ships of 15-17,000 tons mounting 6-9 12" guns. The CB1 class were also envisaged to be deployed 'in kind' as independent commerce surface raiders themselves. The CB type was not envisaged, designed, nor intended to be deployed in the battleline and/or against battleship types. As the very characteristics which define them as battlecruisers effectively precluded such use. A simple definition of the 'Battlecruiser Concept' was the ability to outrun ships which they could not outfight.

Against this background of fast heavily armed foreign pocket battleship/battlecruiser construction the decision was made by the office of the CNO and the Roosevelt administration to construct a class of ship designed expressedly to deal with these specific threats. A relatively high priority was assigned to the design and construction of these ships by the office of the CNO, by deprioritizing the construction of the 5th and 6th (BB65 BB66) battleships of the BB61 class. Which were the ships that the USN's senior staff wanted to construct in lieu of the CB1 class. The 2 CB1 class ships were the only capital units authorized by the Two Ocean Navy Act of 1940 to be completed.

The CB1 class ships were a hybrid design of USN Battleship and Heavy Cruiser design concepts. The design was largely based upon the scaling up USN modern heavy cruiser designs (the CA68 class). Mounting a 12" main armament and adequately protected against 10" gunfire. The hull form and machinery were derived from the Essex CV9 class aircraft carriers. Main armament was a new mark of 12"/50 firing a 945 lb projectile disposed in 3 triple turrets, 2 forward and 1 aft. Secondary armament was the standard USN cruiser configuration of 12 5"/38's in 6 twin mounts disposed in a cruiser style pattern of 4 shipped outboard on the 02 level. Two mounts were superimposed fore and aft on raised platforms over main gun turrets 2 and 3. A tall fire control tower was located forward with a Mk38/Mk8 main battery director. In the base of the fire control tower at maindeck level a 6 aircraft capacity hanger was fitted. Aft of the hanger was an aircraft handling 'welldeck' area with two aircraft catapults sited port and starboard on short towers. A single large tall stack topped with a raked cap was fitted, which had two short masts cantilevered fore and aft at the stack cap level. A relatively tall aft fire control tower was fitted with a Mk38/Mk8 director. As in a typical USN cruiser design 2 Mk37/Mk4 DP directors were mounted fore and aft on the superstructure. A large medium/light AA battery of 20mm and 40mm guns was provided. The CB1 class were the only USN capital ship design to incorporate a transom (squared off) stern. Which effectively increased the length to beam ratio, permitting improved speed performance. The CB1 class was designed with a single rudder which somewhat increased their tactical turning diameter.

In January 1942 the CB1 class ships were briefly evaluated for conversions to aircraft carriers in an emergency war carrier war program similar to that performed on 9 Cleveland (CL55) class light cruisers which were rebuilt into the Independence class light carriers (CVL22 class).

Upon completion both ships served together as carrier escorts in the Pacific Theater during the final months of WWII. CB1 and CB2 defended the stricken, dead in the water, carrier USS Franklin CV13 off Honshu 19 Mar 1945. The CB1 and CB2 also deployed twice in Aug 1945 with TF95 in one of their designed roles as surface raiders. At which they were unsuccessful due to a lack of contact with appropriate Japanese targets. The CB1 class ships were both removed from active service in 1946, stricken from the Naval Register in Jun 1960, and subsequently sold for scrap.

The third CB1 class ship the Hawaii CB3 after launching in late 1945, was first suspended indefinitely, and then finally canceled in 1947. The ship was 82% complete and placed in storage at the PhNSY until sold in 1958 for scrap. CB3 was the subject of 2 design projects. The first a 1948 conversion to a Guided Missile Cruiser (CBG3) fitting modified vertically launched V2 ballistic rockets and the cancelled Triton SSM cruise missiles. The second was a 1953 Carrier TF Command Cruiser (CBC3) project armed with 12 5"/54 single mounts. Both projects were authorized, but both were cancelled prior to commencement.

As with the BB61 class ships, in the mid 1950's the USN evaluated the CB1 class ships for conversion to 'MACK' equipped double and/or single ended Talos/Tartar/ASROC armed ships similar to the Albany CG10 class guided missile cruisers. As the CG10 class were expensive to convert and considered adequate, no conversions of the CB1 class were authorized.

The senior staff of the USN with the exception of the CNO, were never supportive of the CB1 design due largely to the politics that had been involved in their construction. This unfortunately resulted in these fine powerful ships being viewed with a certain amount of distain by the USN's operations staff. The design's perceived and much criticized alleged deficiencies, and shortcomings, coupled with the large construction expenses served to taint the ship's reputations for the length of their active service careers. It is, however, fair to say the bulk of the criticism leveled at the CB1 design was and is largely unfounded, as the design was excellent for their envisaged roles. And when reviewing the design, it should be kept in perspective that they were never intended as a battleship design. Nor were they intended to operate as battleship's. Also, like all USN 3rd generation Capital Ship designs, they were never tested in battle in their intended role of surface action against their own or lesser types of ships. Finally it should be noted, that the tasks that were assigned to them, primarily as carrier escorts, they performed well.

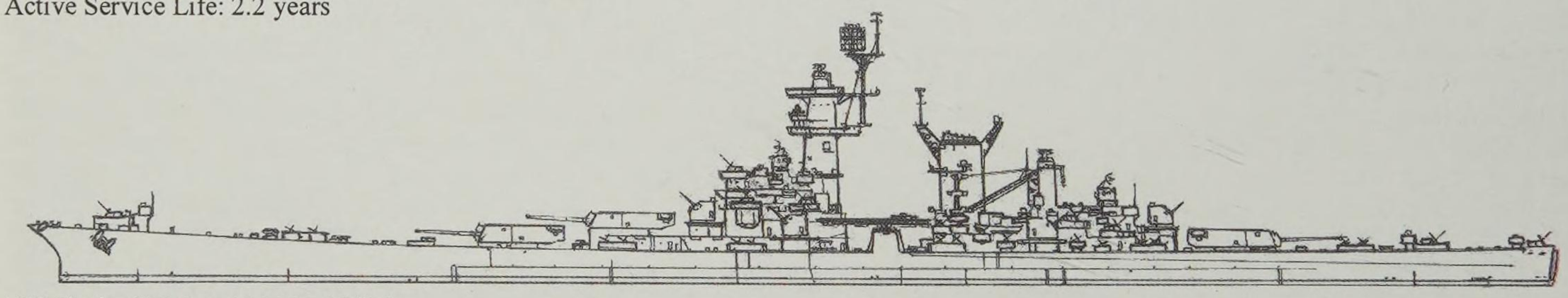
Alaska Class Large Cruiser Statistics 1945

Displacement	Std/FL Designed	27,500 ton/33,148 tons
Dimensions	Length WL/OA/Beam	790'0"/808' 3/16"/90' 9 ¾
	Draught (max)	31' 6"
Machinery	Type	4/Geared Turbines
	Boilers	8 (oil fired) 634psi 850F
	Shafts/designed SHP	4 shafts/150,000 shp nominal
	Rudder	single
	Max Designed Speed	33.40 knts
	Weight of Eng Plnt	3,477.78
	Fuel bunkerage/Range	2,839.2/12,000 nm @15.0kns
	Tactical Diameter	915 yds @ 30 kns
	GM	4.38
Armament	Weight of Broadside	10,260lbs/5.13 tons
	Projectile Weight	1,140lbs/0.57 tons
	Max range	38,573yds/21.92miles
	Rnds/ Weight per Min	3.0/15.39 tons
	Rnds per gun/Total Rnds	166/1,494
	Main	9-12"/50
	Sec	12-5"/38
	AA	56-40mm 34-20mm
Protection	Main (wl) Belt/Incline	9.5" tapered/10degress
	Deck	6.025"/3 decks
	Turret	12.8"face 5"side 6" top 5.25" back
	Total Armor Weight	4,720.47 tons
Catapults/Aircraft	2 Cats/4 Aircraft	

Large Cruiser USS Alaska CB1 Call Letters: **NUGW**

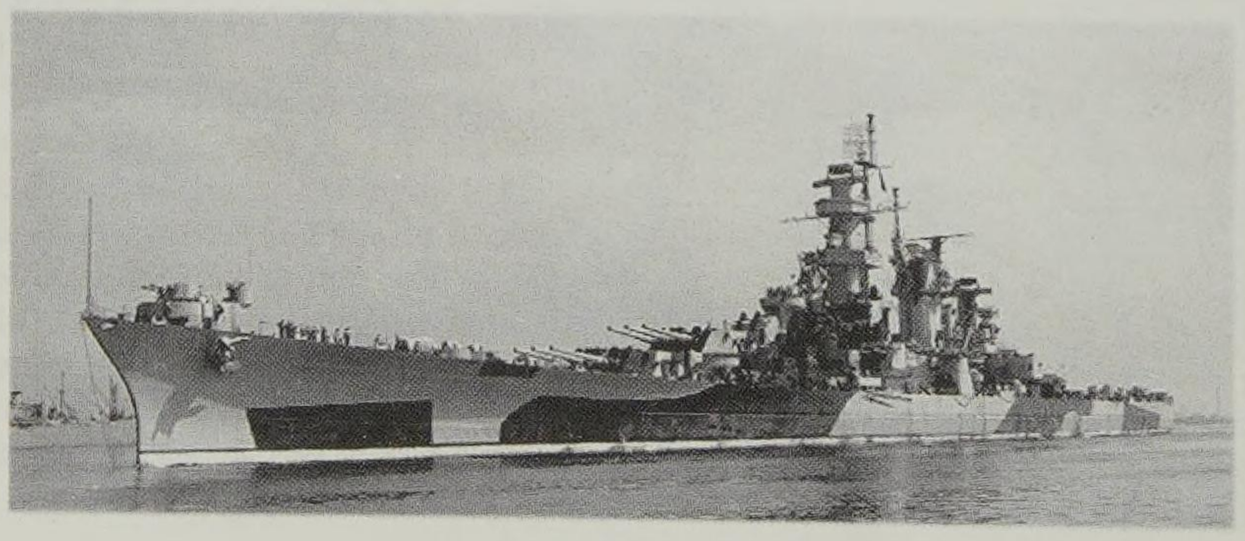
Builders Yard:	New York Shipbuilding Co Camden NJ			
Reserve Group	Bayonne Naval Annex NJ			
Scrapping Yard:	Lipsett Co Camden NJ			
Ordered	Keel Laid	Launched	1st Comm	
9 Sep 1940	17 Dec 1941	15 Aug 1943	17 Jun 1944	
Reserve	Decom	Stricken	Sold	Scrap
13 Aug 1946	17 Feb 1947	1 Jun 1960	24 May 1961	Jul 1961

Active Service Life: 2.2 years

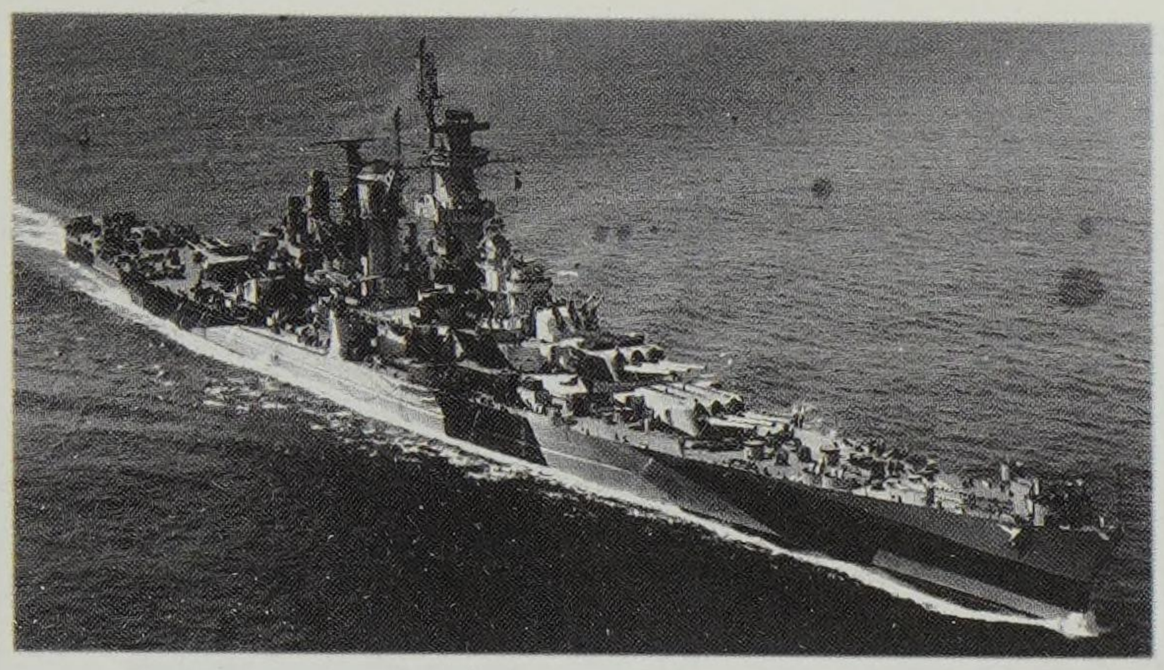


USS Alaska CB1 Aug 1944 Ms32/1d

Right: 15 Aug 1943 Federal SBCo. Kearny NJ. CB1 has just been launched and required approximately 11 months of fitting out prior to commissioning with a further 4 month shakedown and training period before reaching IOC (Initial Operational Capability) in Nov 1944. Note dark color hull primer and the light colored underwater hull.

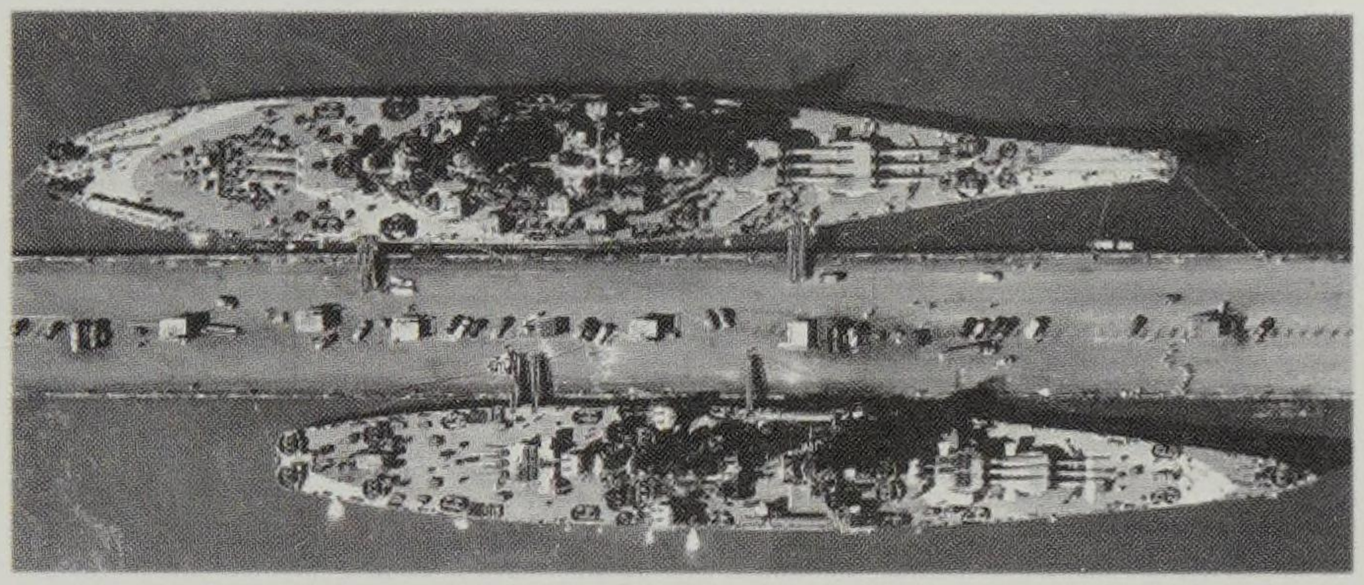


Left: 30 Jul 1944 off Philadelphia NSY. CB1 underway in the Delaware River. Note the long graceful cruiser hull lines, the massive single stack and the 40mm position forward on the bow. Also note the catapults amidships. Photos of the CB1 during this period show the ship's hull bottom is still a pale/light gray color hull primer. The standard hull red color was applied during the standard post shakedown inspection drydocking. BB63 and BB64 also had light gray underhull when 1st commissioned.



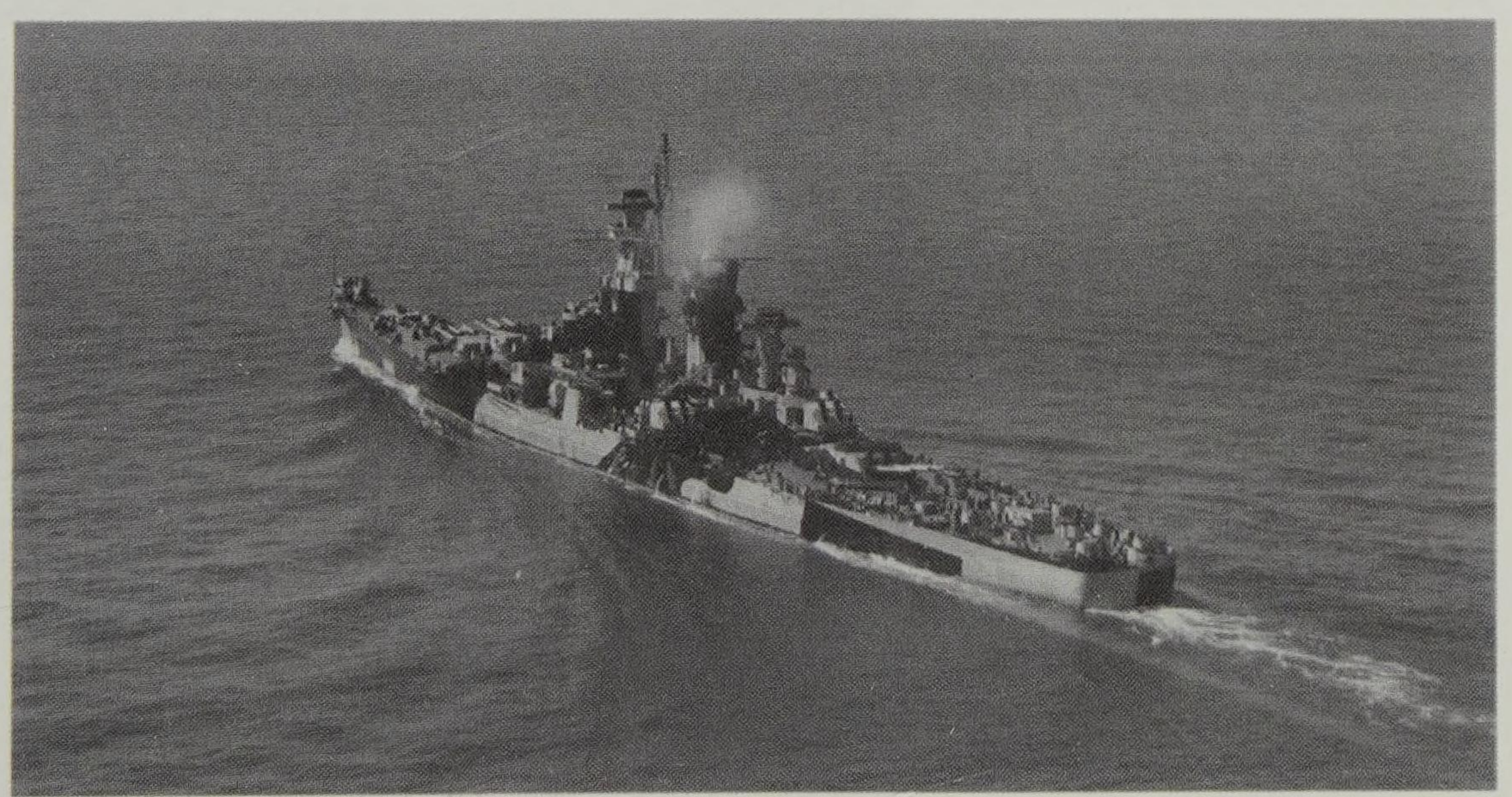
Left: 1 Sep 1944 off the East Coast. CB1 during the ship's shakedown cruise. Two Mk37 DP directors are fitted fore and aft, with the 5"/38 battery disposed in a typical USN WWII cruiser pattern with mounts superfiring over turrets 2 and 3. These mounts were able to fire on targets traversing athwartships from port to stbd or vice versa. This allowed an aerial target to remained engaged as it crossed the ship and eliminated the delay when the target had to be reacquire by the heavy AA battery on the opposite side of the ship. This superfiring arrangement was unique among USN Capital Ship Designs.

Right: Aug 1944 Norfolk NSY. USS Missouri BB63 (top) and CB1 (bottom). Note the difference in hull length, beam (108' vs. 88'), and general hull forms. Note also the long taper of the forward lines of BB63. The Ms32 camouflage pattern is painted across maindecks of both ships. BB63 and CB1 trained together on shakedown to Trinidad in Jul-Sep 1944.

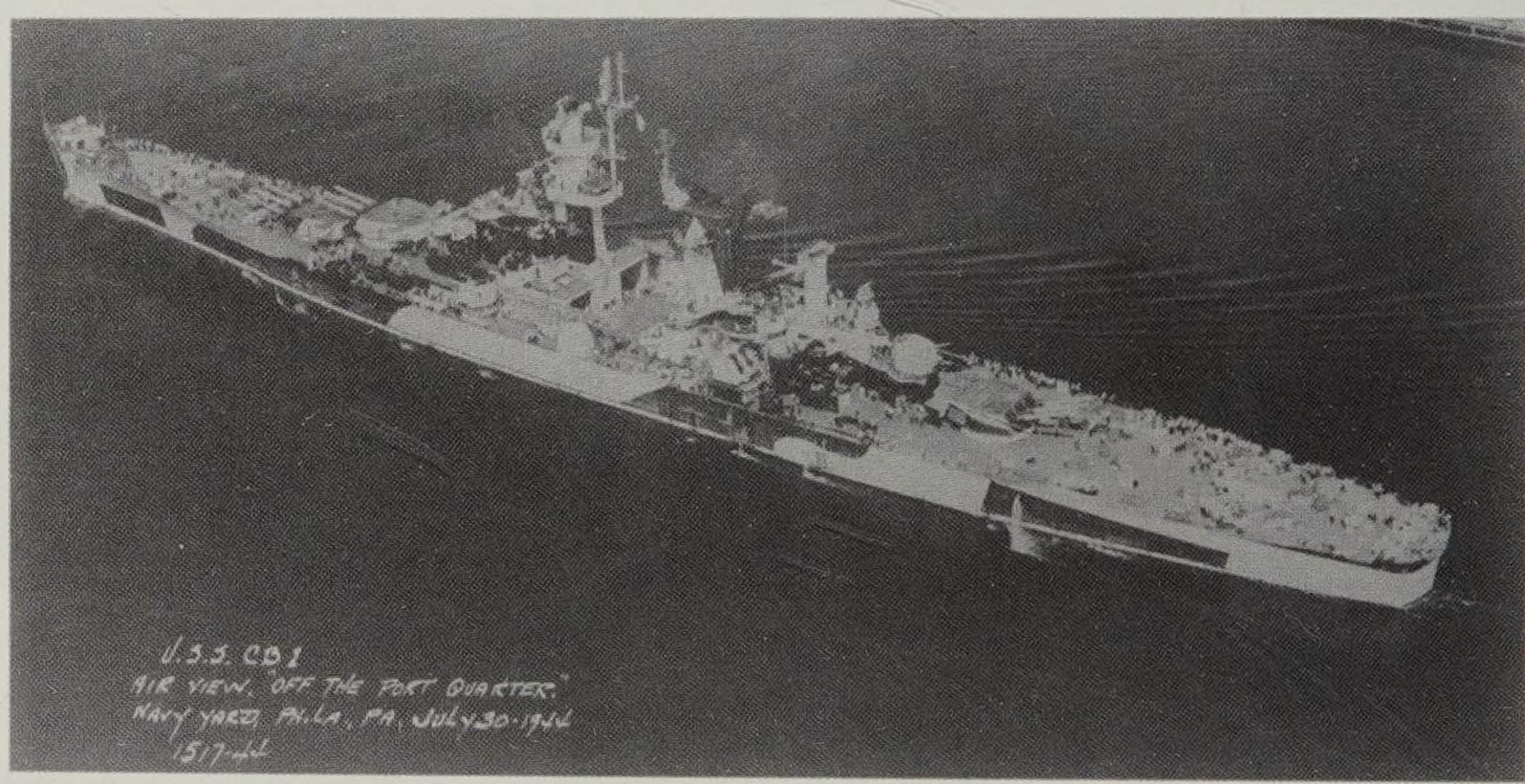


Left: Aug 1944 off East Coast. CB1 on builder's trials. Note the location of the Flagstaff on the fantail. CB1 and CB2 both worn cruiser "c" type designs of the Ms32 system and both ships retained them until arrival on the West Coast. dbc

Right: 30 Jul 1944 CB1 off Philadelphia NSY. Note the transom stern which was unique among USN Capital Ship Designs Fitted only to the CB1 class ships. Also note the tall forward fire control tower. The shorter aft rangefinder tower enabled target tracking at a maximum range of approximately 12 miles, whereas the forward director had a range of about 22 miles. dbc



Port of Spain Trinidad, British West Indies Nov 1944. CB1 at anchor in the company of the also newly commissioned battleship Missouri. The battleship sized cruiser is on shakedown and work up cruise, conducting extensive training, as the crew learns to fight their new ship. The ship is the sleek powerful lead of a new type of USN Capital Ship design. The angle of the ship serves to accentuate the sweeping graceful cruiser lines of the unmistakable silhouette of this class of ships. In the Pacific, while operating a member of the fast carrier escort group supporting the strike operations off the Island of Kyushu on 19 March 1945. Alaska and sister battlecruiser Guam distinguished themselves by repelling repeated Japanese air attacks attempting the sink the stopped, badly damaged, burning fleet carrier USS Franklin CV13.

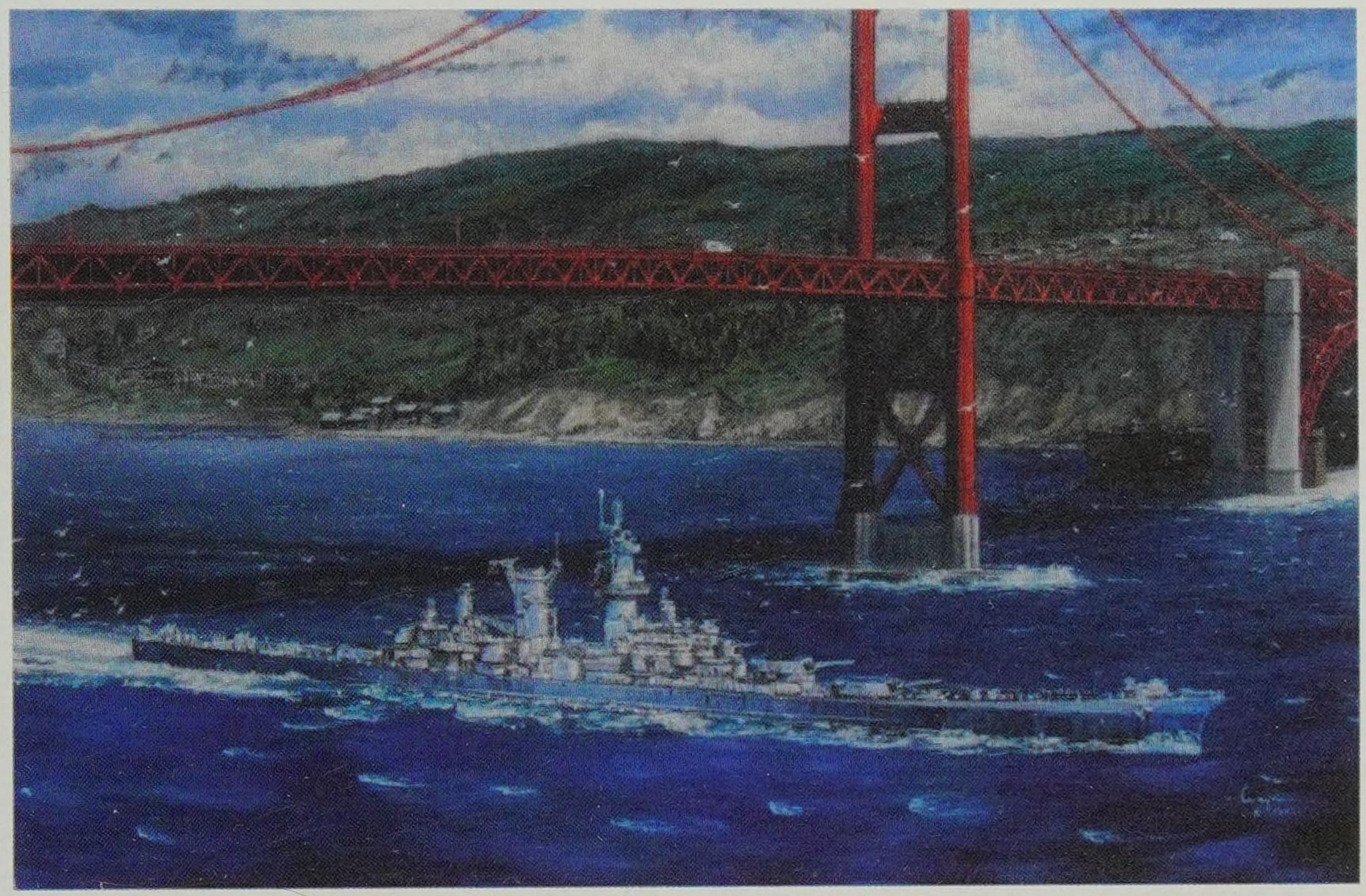


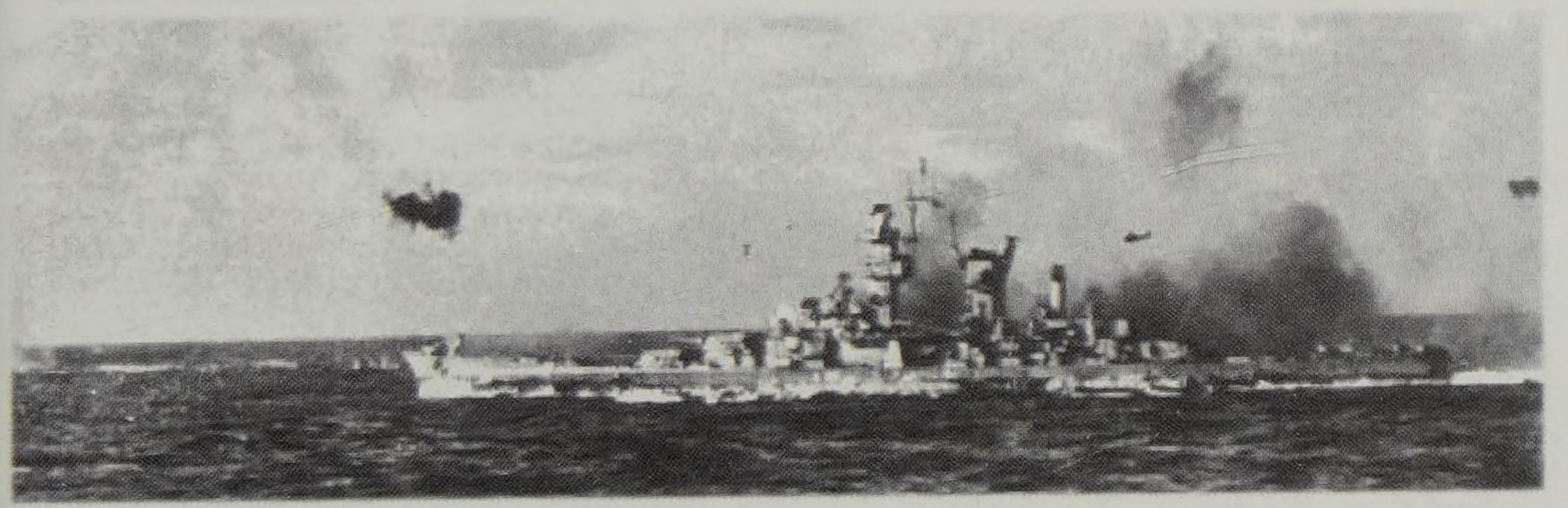
Right: 30 Jul 1944 off Philadelphia NSY. CB1 illustrates the unique arrangement of the 40mm AA battery on the fantail. The after pair of 40mm's was set slightly below deck level. The Fantail was the usual location for aircraft facilities in USN BB CA and CL WWII designs. The aircraft handling facilities location amidships was unique to the CB1 class ships. dbc

Left: Aug 1944 off the East Coast. CB1 is seen broadside while underway. Note the long low sleek lines and tall stack of this class of ship. Note the aircraft handling welldeck on the maindeck level forward of the stack. The CB1's received this as it was felt that a sheltered area for aircraft handling was necessary for independent commerce surface raider all weather pursuit and/or offensive operations. dbc

Left: 31 Nov 1944 Philadelphia NSY. CB1 departing for the Pacific. CB1 wore Ms32/1c to Hunters Point NSY where the CB1 was repainted into Ms22 prior to deploying, as was the BB63 which had accompanied CB1 during the Panama Canal transit. The aircraft are Curtiss SC1 Seahawks. CB1 was the first ship to deploy SC1's. Note the folded wings. dbc

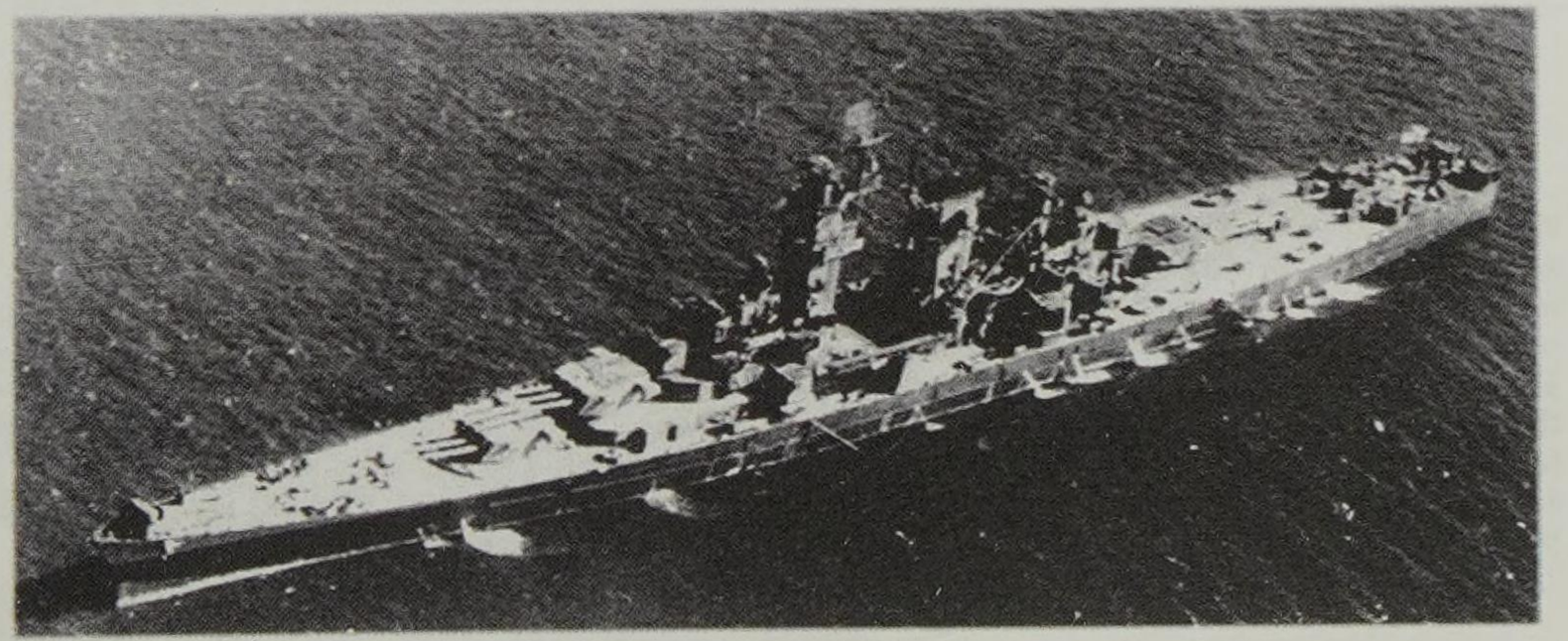
Right: Dec 1944 CB1 under the Golden Gate Bridge, San Francisco Bay CA. The battleship sized, cruiser design, hybrid ships of the Alaska class were unique in the USN. Germany completed 2 similar, but more heavily armored 26,000 ton Scharnhorst class CB's armed with 9 11" guns. France completed 2 26,000 ton Dunkerque class CB's with 8 13" guns. The CB1 class ships were hurriedly designed in response to these ships and amid intelligence reports that Japan was also constructing 'pocket battleship' types. Hunters Point NSY in Southern San Francisco Bay was a standard stopping point for upkeep on BB/CB types enroute to the Pacific Theater. In the early days of WWII in the Pacific, the US military considered the Golden Gate Bridge and San Francisco to be a very high priority target for bombardment by Japanese BB's. As a result the US Army built an extremely powerful coastal artillery defense system of hardened gun positions up to 16" caliber and laided extensive minefields off the Golden Gate channel.





Left: 8 Mar 1945 off Kyushu Japan. CB1 engaging a twin engine P1Y1 Ginga "Frances" Kamikaze seen over the aft DP director that is attacking the Aircraft Carrier USS Intrepid CV11 teaming ahead of CB1 (Note CV11's wake behind CB1). The aircraft struck CV11 forcing the ship to return to the US for repairs. Paint is Ms22. Note the high bow wave which was similar to the bow waves formed by the short hulled CV9 class Carriers.

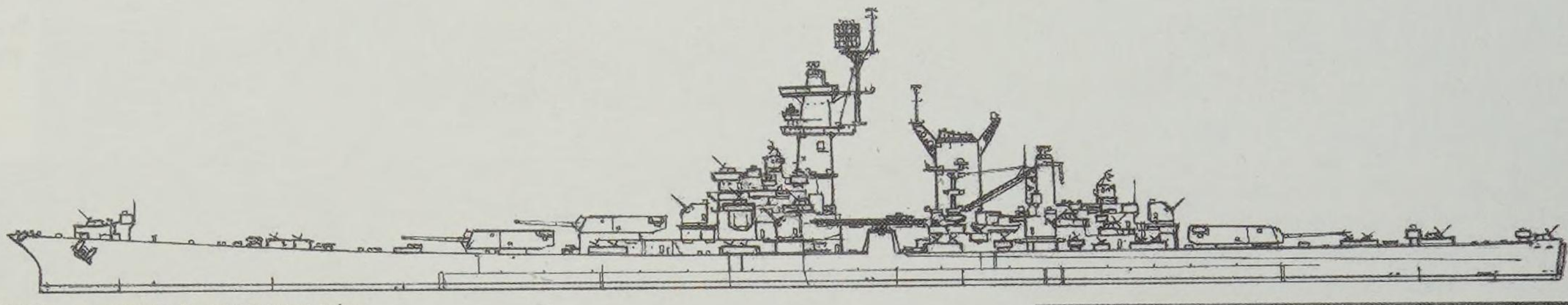
Right: Circa Jan 1946 off Boston NSY. CB1 undergoing tank flushing prior to reporting to Bayonne NY Naval Supply annex for reserve duty. Note the 20mm's have been removed and the 40mm's have been canvas covered and preserved prior to being fitted with semi-hemispherical cocoons. Paint remains Ms22.



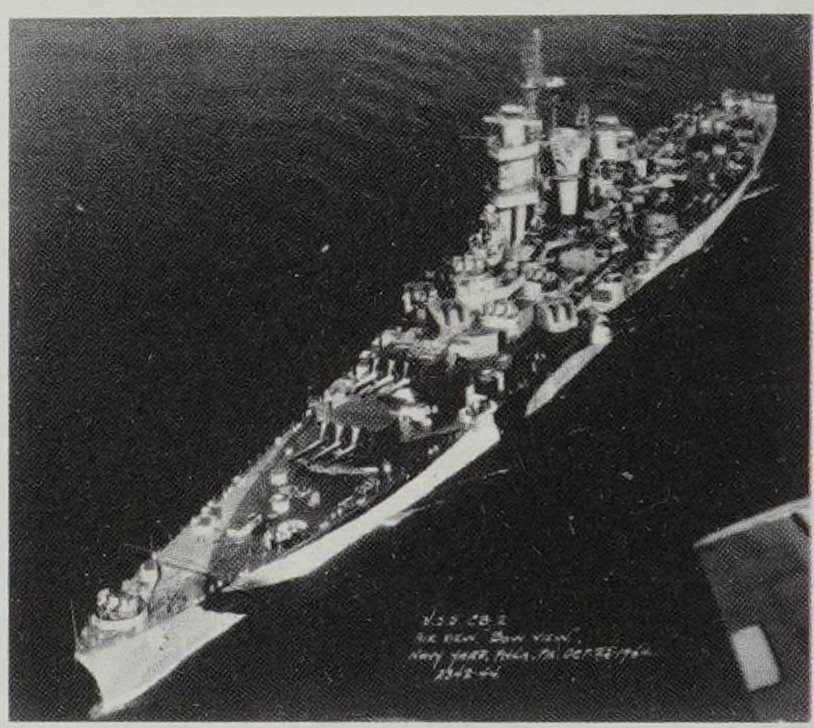
Large Cruiser USS Guam CB2 Call Letters: **NUBD**

Builders Yard	New York Shipbuilding Co Camden NJ			
Reserve Group	1947-1961 Bayonne Naval Annex NJ			
Scrapping Yard	Lipsett Co Camden NJ			
Ordered	Keel Laid	Launched 1	1st Comm	
9 Sep 1940	2 Feb 1942	21 Nov 1943	17 Sep 1944	
Reserve	Decom	Stricken	Sold	Scrap
13 Aug 1946	17 Feb 1947	1 Jun 1960	24 May 1961	Jul 1961

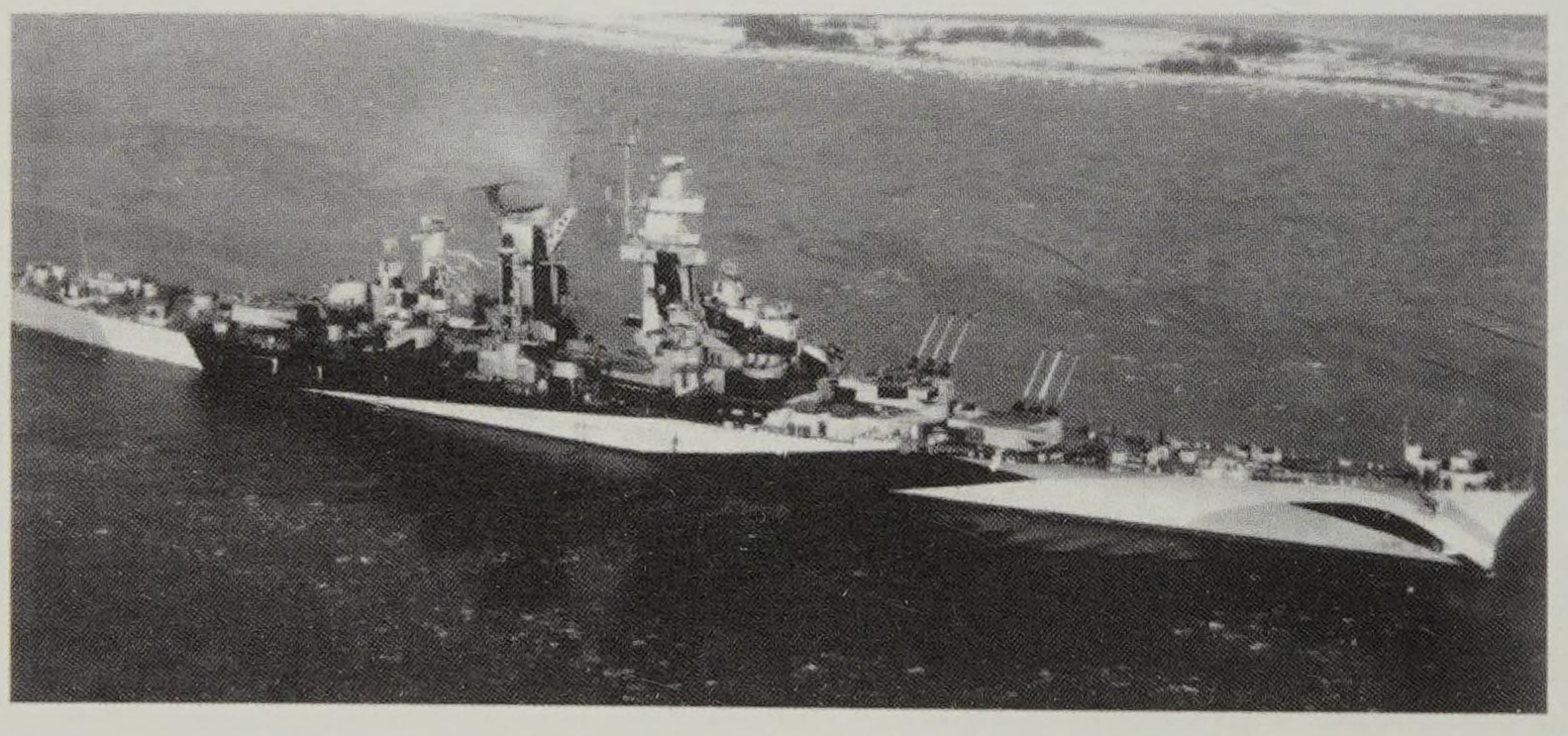
Active Service Life: 1.8 Years



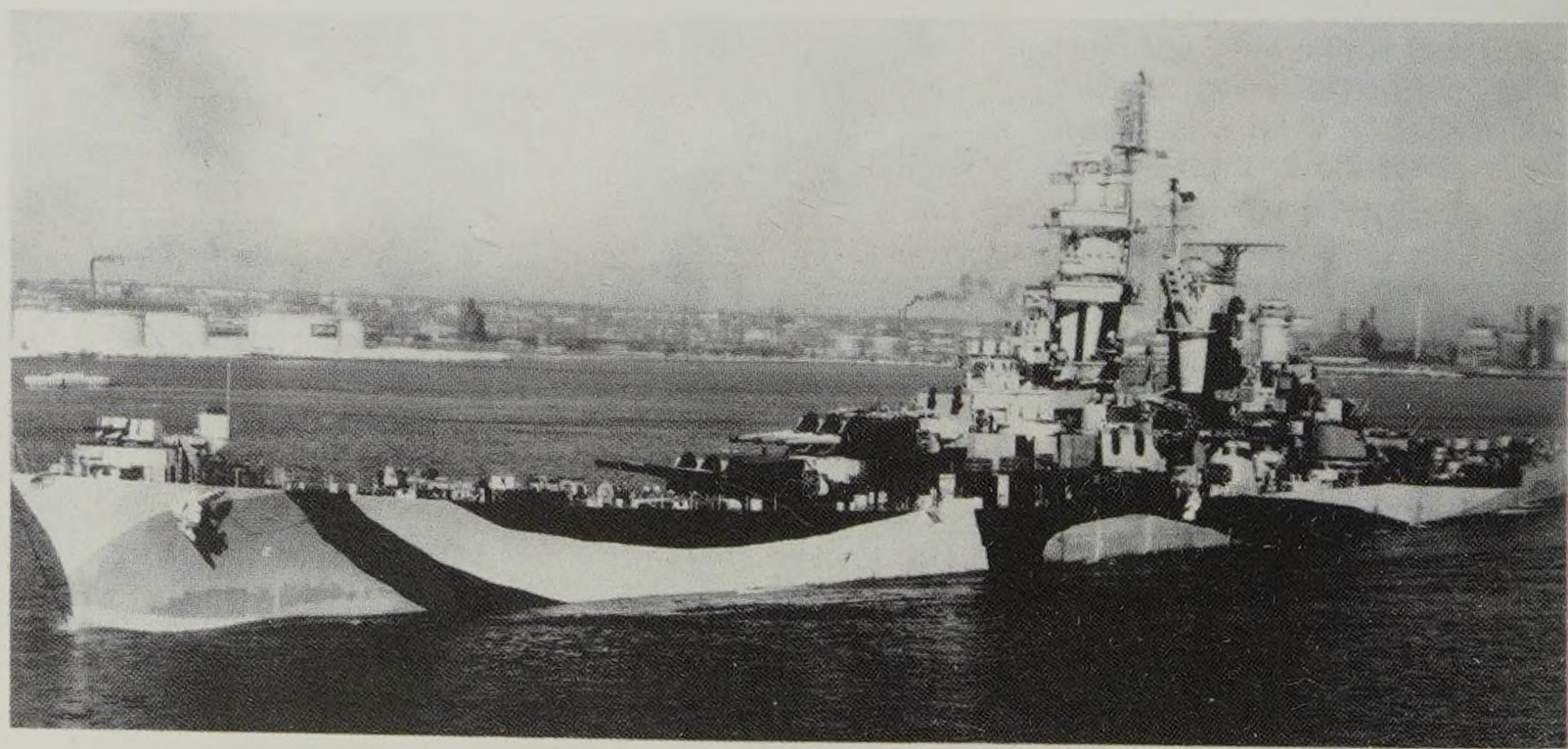
USS Guam CB2 Feb 1945 Ms32/7c



25 Oct 1944 Delaware River off Philadelphia NSY. The CB1 class ships were ascetically a very graceful looking design with extremely fine lines. Note the long hull form and the narrow (88') beam. The camouflage pattern has been carried across the deck. The photographing aircraft is being used for AA tracking exercises by the forward DP battery.



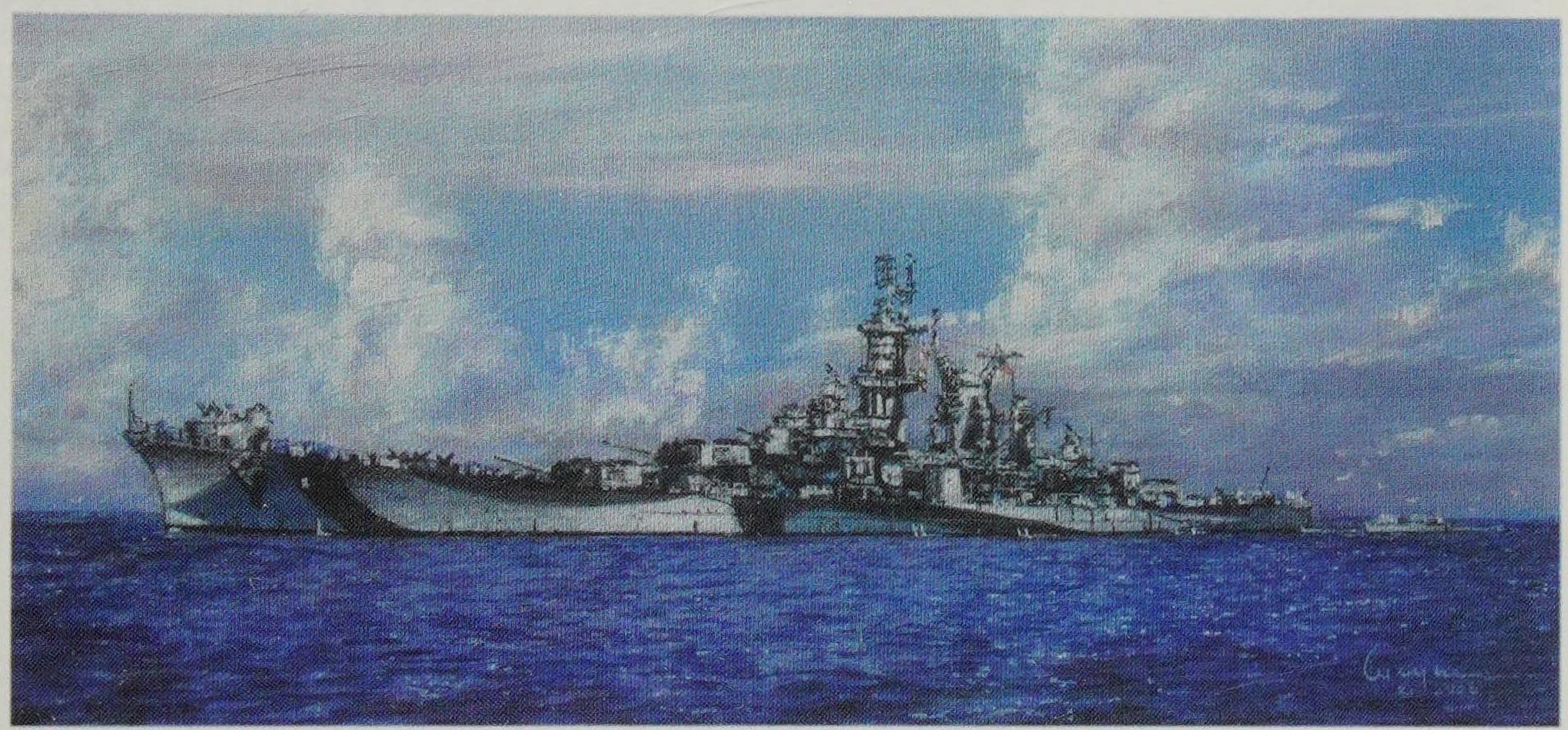
Left: 25 Oct 1944 Delaware River NJ. CB2 underway departing her builders yard enroute to Trinidad on the ship's shakedown cruise. Note the forward turrets swung out to port with the guns at maximum elevation. Also notice the ice in the river.



Right: 25 Oct 1944 Delaware River NJ. Another view of CB2 departing the builder's yard. CB1 and CB2 were the most camera shy of all the USN Capital Ships with few released photographs of them after their shakedown cruises. Note the "wavy" irregular demarcation lines on the colors of the camouflage pattern.

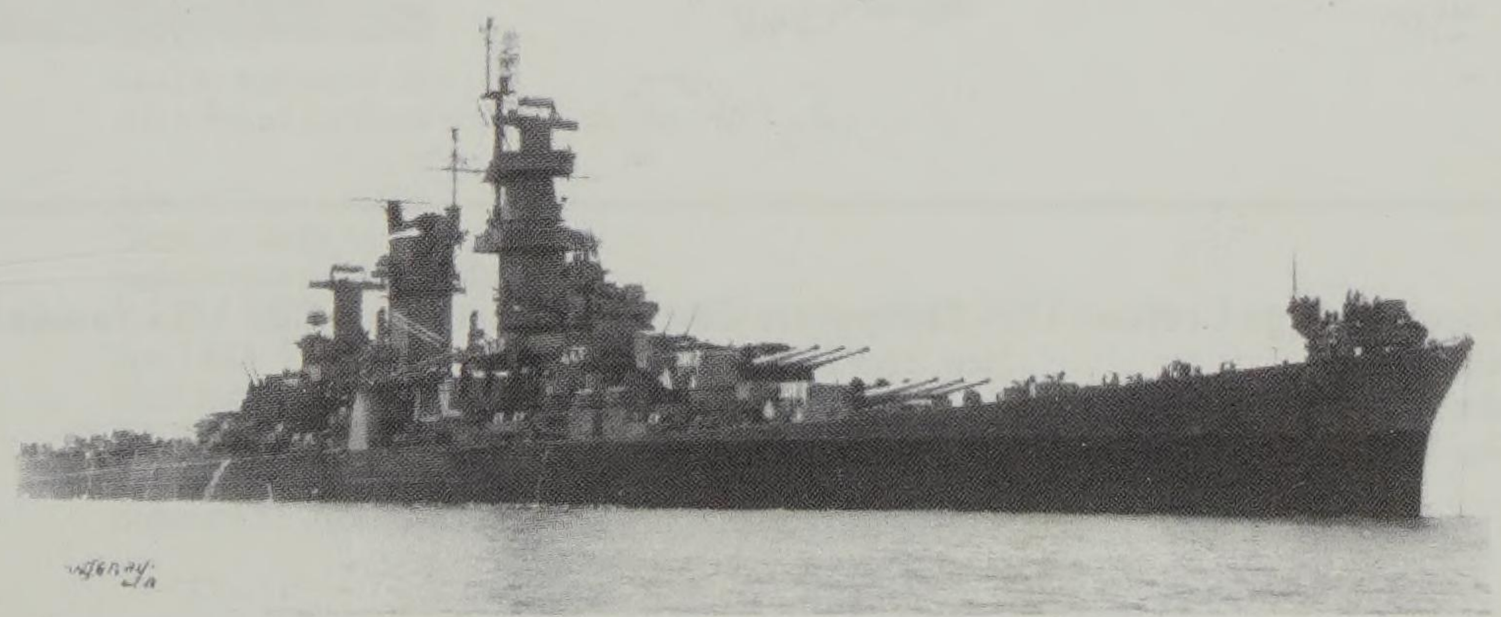
Left: Circa Oct 1944 Delaware River NJ. The CB2 is slowly negotiating the icy narrow channel. The newly commissioned battleship sized cruiser will complete her shakedown cruise and predeployment training by mid March. Then transit the Panama Canal arriving to join the fleet in Mar 1945. Just in time to support the final carrier strikes against Japan. In the background are the massive refineries of the petro-chemical plants which line the banks of the heavily industrialized lower Delaware River. Moored at the various refinery loading docks are 3 T2-SE tankers being loaded in preparation to delivering vital petroleum products and fuels to the theaters of the war.

Right: Nov 1944. Large Cruiser Guam arriving on her shakedown cruise off Port of Spain Trinidad. The ship is preparing to take aboard a pilot who will navigate the ship into the fleet anchorage. Guam is the second and last completed unit of this powerful new type of USN capital ship. The Alaska class cruisers were not chosen to serve in the postwar fleet and both spent 15 years moored next to one another rusting away at the Bayonne Naval Annex in New Jersey until sold for scrap in 1961.



Left: 21 Feb 1945 Pearl Harbor Hi. CB2 enroute to the Pacific Combat Zone off Japan. Note the port catapult and crane trained outboard. The ship has been repainted to Ms 22. As both CB1 and CB2 were painted Ms22. And as they had no unique detail differences they appeared identical from 1945 to 1961. They were distinguishable only by their hull numbers.

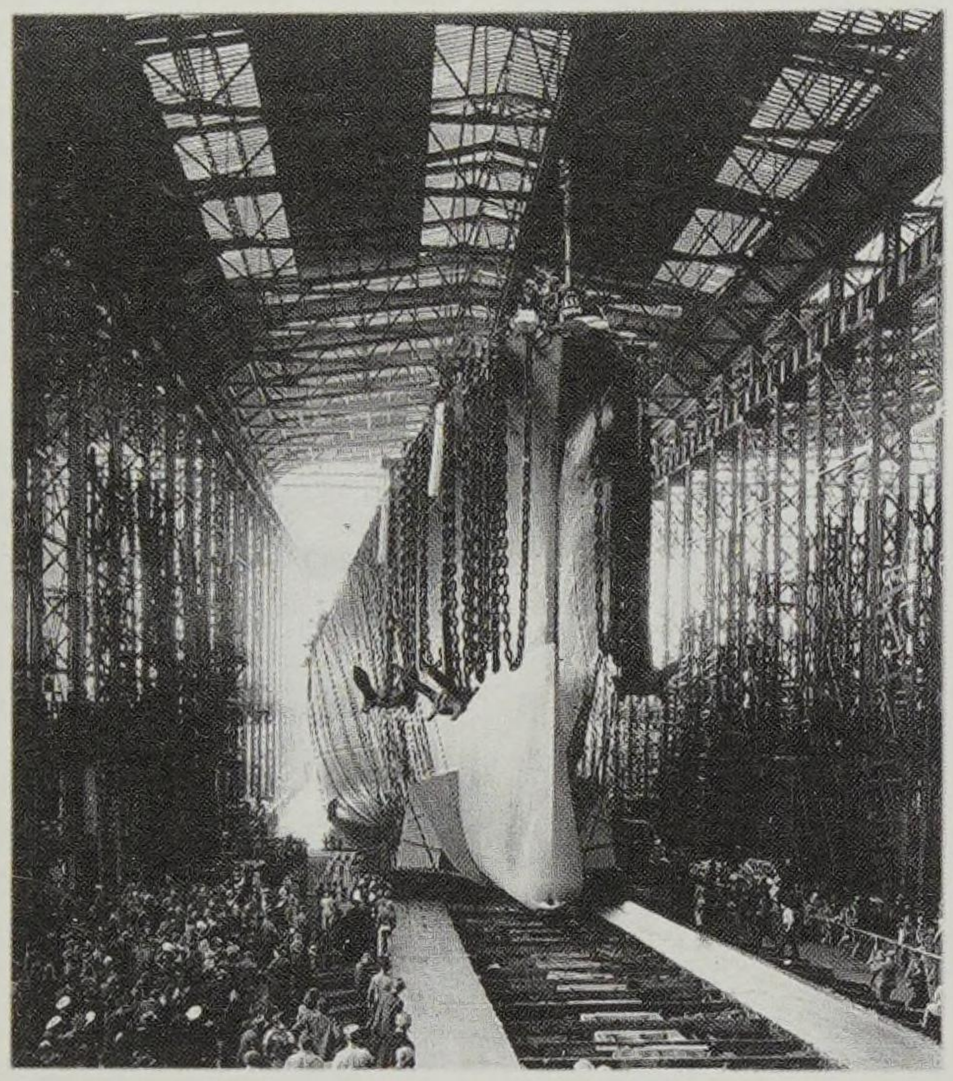
Below: circa Apr 1945 .Unknown Location. CB2 at anchor. The CB1 and CB2 operated together after Mar 1945. Both remained in the Far East after the surrender to accept and enforce the terms of the Japanese surrender in Korea and China. Both ships returned to the US in Dec 1945.



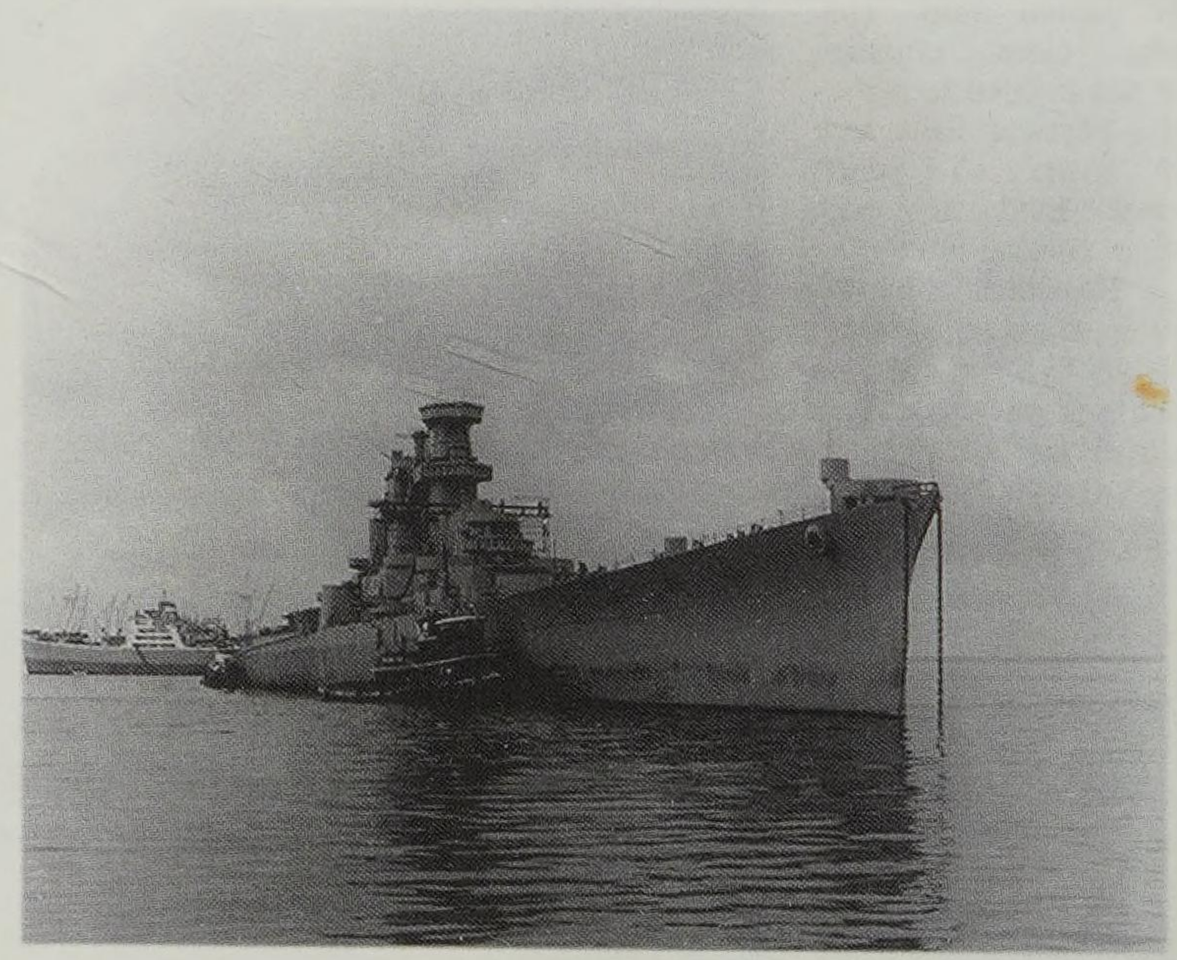
Large Cruiser USS Hawaii CB3 (CBG3 CBC3) Canceled Call Letters:

Builders Yard	New York Shipbuilding Co Camden NJ		
Modernizing Yard	-		
Modernizing Yard	-		
Reserve Group	Philadelphia NSY		
Scrapping Yard	Boston Metal Co Baltimore ND		
Ordered	Keel Laid	Launched	1st Comm
9 Sep 1940	20 Dec 1943	3 Nov 1945	-
Decom	Canceled	Stricken	Sold
-	12 Aug 1945	9 Jun 1958	15 Apr 1959
Scrapped			
6 Jun 1959			

Notes : proposed conversions: Guided Missile Cruiser CBG3 auth 1948 canceled 1949
Command Ship CBC3 auth 1953 canceled 1954
Held in reserve approximately 82% complete until 1958



Left: 3 Nov 1945 New York Shipbuilding Co Camden NJ. CB3 at launching. The CB1 class ships had extremely short active service lives (less than 2 yrs) for such expensive and formidable ships. While the CB1 class ships were not selected to serve with the post war fleet they would have nonetheless made powerful escorts for the carrier task forces that kept the Peace and deterred Communist aggression during the 40 years of the Cold War Era. They also would have provided additional relative new and unused capital ship hulls for modernizations programs similar to those performed on the BB61 class ships in the 1980's. The CB1's were more than adequately protected against modern anti-ship missiles which have the striking power roughly equivalent to a conventional 8" round. As the CB1 class ships were protected against 10" gunfire. They also could have served well as the Capital Ship within the Surface Action Groups (SAG). Which were built around the modernized BB61 class ships in the 1980's.



29 Jun 1959 Philadelphia NSY. CB3 under tow to Boston Metal's Yard in Baltimore for scrapping. The main turrets were removed in 1954 when the ship started conversion to CBC3. Note the Ms13 paint patchworked down to the ships nominal waterline also the unusual absence of a hull number.

Canceled Large Cruisers USS Philippines CB4 USS Puerto Rico CB5 USS Samoa CB6

Builders Yard	New York Shipbuilding Co Camden NJ	
Ordered	Canceled	
9 Sep 1940	24 Jun 1943	

USN Camouflage Measures (Ms) 1941-1963

Camouflage painting as employed on USN Capital Ships in WWII was intended to provide five basic types of concealment/deceptions:

Speed deception Ms1

Range deception Ms 2 Ms12 Ms18 Ms22

Reduced contrast Ms1 Ms12 Ms13 Ms14 Ms15

Course and ship silhouette deception Ms31 Ms12(mod) Ms32 Ms33

Blending with ocean colors Ms1 Ms11 Ms12 Ms15 Ms21

The USN employed 14 different primary measures of camouflage patterns on Capital Ships 1941-1945. The specific directions for a camouflage pattern that was to be applied to a specified type and class of ship was designed and specified by the Camouflage Section of the Bureau of Ships. The specific measure and pattern were selected from these approved class type design drawings by the ship's CO according to operation requirements and measure/pattern suitability. The patterns were then applied per the class type design drawings and in accordance with instructions contained in the manuals C&R 4 1937 Ships Camouflage Instructions, Ships-2 , Jan 1941, Sep 1941, Jun 1942, Mar 1943, Ship-2 Supplement to Rev 2 Instructions for Painting and Cementing of United States Naval Vessels.

Types of Camouflage Measures Applied to USN Capital Ships

Measure 1	Dark Gray System	Jan 1941
	Dark gray 5-D	Vertical Surfaces
	Light Gray 5-L	Vertical surfaces upper superstructure Masts, Fire Control Tower
Measure 2	Graded System	Jan1941
	Light Gray 5-L	Vertical surfaces of superstructure an upper hull line
	Dark Gray 5-D	Hull surface to straight line along lowest level of main deck.
Measure 5	False Bow Wave	Jan 1941
	White 6-W	Bow wave form
	Dark Gray 5-D	Fill in of bow wave area (optional)
Measure 11	Sea Blue System	Jan 1941
	Sea Blue 5-S	All vertical surfaces
Measure 12	Graded Pattern System	Sep 1941
	Sea Blue 5-S	Hull to an irregular undulating deck line
	Haze Gray 5-H	Superstructure and upper part of hull line
	Ocean Gray 5-O	Splotched irregular patterns over Haze Gray
Measure 12 (modified)	Splotched Pattern System	Sep 1941
	Sea Blue 5-S	Vertical Surfaces splotched irregular pattern
	Pale Gray 5-L	Vertical Surfaces random areas within 5-O pattern areas
	Haze Gray 5-H	Vertical Surfaces above hull color demarcation line
	Ocean Gray 5-O	Vertical Surfaces splotched over 5-H in an irregular pattern
Measure 13	Haze Gray System	Jan 1941
	Haze Gray 5-H	All vertical surfaces
Measure 14	Ocean Gray System	Jan1941
	Ocean Gray 5-O	All vertical surfaces
Measure 15	Disruptive System	Jun 1942
	Sea Blue 5-S	Vertical Surfaces splotched irregular curved patterns
	Haze Gray 5-H	Vertical Surfaces
	Ocean Gray 5-O	Vertical Surfaces splotched irregular curved patterns
Measure 18	Blue Hull System	Jun 1942
	Navy Blue 5-N	Hull to maindeck line
	Haze Gray 5-H	All vertical surfaces above deckline
Measure 21	Navy Blue System	Jun 1942
	Navy Blue 5-N	Vertical surfaces
1945 Revision	Navy Gray 7-G	Substituted for Navy Blue
Measure 22	Graded System	Jun 1942
	Navy Blue 5-N	Hull surface to straight line along lowest level of main deck
	Haze 5-H	All vertical surfaces above deckline
1945 Revision	Navy Gray 7-G	Substituted for Navy Blue
1945 Revision	Deck Gray 20-G	Substituted for Deck Blue

Measure 31	Dark Pattern System Dull Black Bk/or Navy Blue 5-N OceanGray5-O Haze Gray 5-H (5-0 pattern areas optional)	Mar 1943 Geometric patterns on vertical surfaces Geometric patterns on vertical surfaces Vertical surfaces
Measure 32	Medium Pattern System Navy Blue 5-N/or Dull Black Bk Ocean Gray 5-O Haze Gray 5-H (5-0 pattern areas optional)	Mar 1943 Geometric patterns on vertical surfaces Geometric patterns on vertical surfaces Vertical surfaces
Measure 33	Light Pattern System Navy Blue 5-N Ocean Gray 5-O Pale Gray 5-P (5-0 pattern areas optional)	Mar 1943 Geometric patterns vertical surfaces Geometric patterns vertical surfaces Geometric patterns vertical surfaces

USN Deck Colors

1940-1941 All horizontal surfaces painted Deck Blue 20-D unless otherwise specified in camouflage pattern drawings. Except wooden deck areas which were left unpainted natural teak.

1942-1944 All horizontal surfaces painted Deck Blue 20-D unless otherwise specified in camouflage pattern drawings.

1945-1947 All horizontal surfaces painted Deck Blue 20-D (replaced with Deck Gray after 1947) except for teakwood deck areas which were left unpainted.

USN Hull Underwater Sections Colors

All wetted hull surfaces below the waterline were painted with an Anti Fouling paint known as "Norfolk Red" which was a medium to dark red oxide color. The red oxide coloration was due to the large amount of copper pigment used in the paint to inhibit hull fouling by marine growth. Some East Coast construction ships (BB63 BB64 CB1) were completed with and ran trails with the underwater hull painted a light gray primer, the Norfolk Red paint coat was added in post shakedown drydock periods. A "Boot Topping" of special black paint designed for maximum salt water/air corrosion resistance was added in a horizontal 6' wide stripe around the hull above the "Hull Red" and below the hull's freeboard color. This stripe was centered on the ship's normal displacement waterline. Numerical draft marking numbers in white below the freeboard and black above were also carried at the extreme fore and aft counters.

USN Hull Lettering

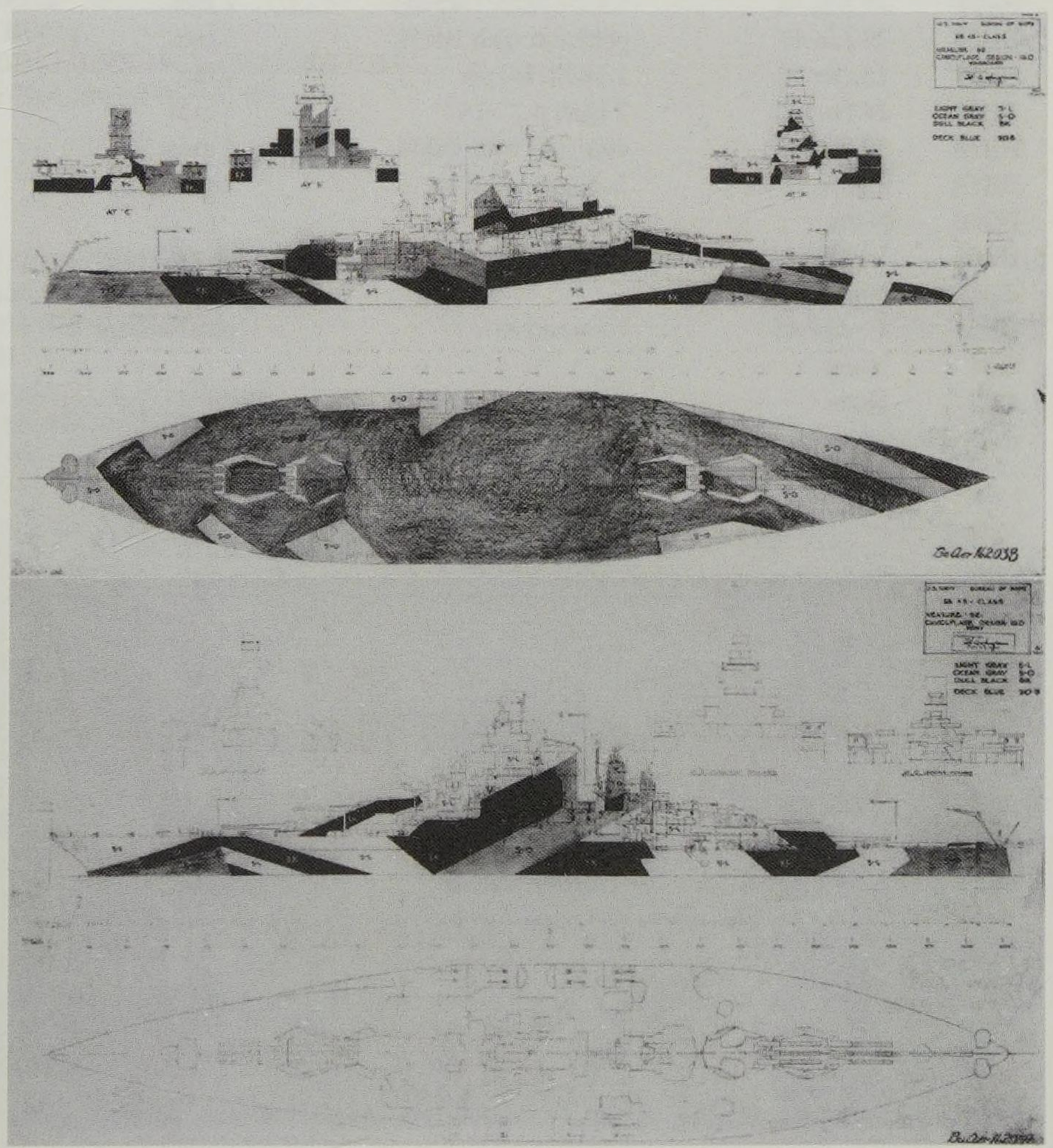
1940-1941	USN Battleships displayed no hull number markings. Ship's name in black or painted over raised steel letters on stern counters.
1942-1945	USN Battleships displayed hull numbers on the forward and stern counters in 2' unshadowed White numbers. Hull numbers were painted in Dull Black if applied over pale gray (BB56 1944). Raised steel letters of the ship's names on stern counter(s) painted over to match hull colors.
Sep-Oct 1945	Ship names on stern were painted in White 1' lettering, on dark painted hulls (5-D,5-0,5-N) and Dull Black on light painted hulls (5-H). BB's participating in Oct 1945 Navy Day Celebrations and Fleet Reviews and some BB's returning from Pacific Theater had 6' ship's name in White temporarily applied to hull. The name was centered horizontally below deckline amidships in 6' unshadowed lettering. Removed by Dec 1945.
1946-1952	Mix of 2' White unshadowed and starting in 1951 6' White with Dull Black shadowed hull numbers on the BB61 class. BB61 alone carried 6' White unshadowed hull numbers in 1947 reverting to 2 ' white hull numbers by 1948. Reserve BB's began receiving 6' White Black shadowed hull numbers during scheduled repaints.
1953-1963	USN BB's displayed standard 6' bow and 4' stern counters White with Dull Black shadowed hull numbers. Dull Black names across stern. Reserve status BB's/CB's continued to receive the new style hull numbers as part of repaints per maintenance schedules.

Turret Top Lettering 1940-1963

1940-1942	USN BB's had Large Hull Numbers painted with White atop turret 2. Removed by 1 Feb 1942.
1942-1948	USN BB's had no turret top numbers.
1949- 1958	USN BB61-BB64 had 6' White 6-W Hull Numbers shadowed in Dull Black painted atop turret 1 during the Korean War. From about 1954 onwards an 8'-10' National Ensign was painted atop turret 1 or 2.

Camouflage Schedule for USN Capital Ships 1941-1947

Hull No.	1941	1942	1943	1944	1945	1946/47
AG16	Ms1					
AG17	Ms12	Ms12	Ms22	Ms22	Ms22	Ms22
BB33	Ms12	Ms12	Ms21	Ms31a/7b	Ms21	Ms21
BB34	Ms12	Ms12	Ms22	Ms31a/8b	Ms21	Ms21
BB35	Ms12m	Ms12m	Ms22	Ms22	Ms21	Ms21
BB36	Ms1/5	Ms11	Ms14	Ms22	Ms32/6b	Ms21
BB37	Ms1/5					
BB38	Ms1	Ms11	Ms21	Ms21	Ms21	Ms21
BB39	Ms1					
BB40	Ms12m	Ms21	Ms21	Ms32/6d	Ms21	Ms21
BB41	Ms1	Ms22	Ms22	Ms32/6d	Ms21	Ms21/13
BB42	Ms2/Ms12m	Ms14	Ms2	Ms21	Ms21	Ms21
BB43	Ms1	Ms11	Ms14	Ms32/1d	Ms21	Ms21
BB44	Ms1	Ms14		Ms32/16d	Ms21	Ms21
BB45	Ms14	Ms11	Ms32/3d	Ms32/3d	Ms21	Ms21
BB46	Ms1	Ms14	Ms31a/7d	Ms31a/7d	Ms21	Ms21
BB48	Ms1	Ms14		Ms32/7d	Ms32/7d	Ms21
BB55	Ms3/Ms12	Ms21	Ms32/18d	Ms32/18d	Ms22	
BB56	Ms1	Ms12	Ms22	Ms22	Ms22	Ms22
BB57		Ms12	Ms21	Ms21	Ms21	Ms21
BB58		Ms14/Ms15	Ms32/11d	Ms32/11d	Ms22	Ms22
BB59		Ms12	Ms22	Ms22	Ms22	Ms22
BB61			Ms22gry	Ms32/1b	Ms32/1b	Ms22/13
BB62			Ms21	Ms21	Ms22	Ms22/13
BB63				Ms32/22d	Ms22	Ms18/13
BB64				Ms22	Ms22	Ms22/13
CB1				Ms32/1d	Ms22	Ms22
CB2				Ms32/7c	Ms32/7c	Ms22

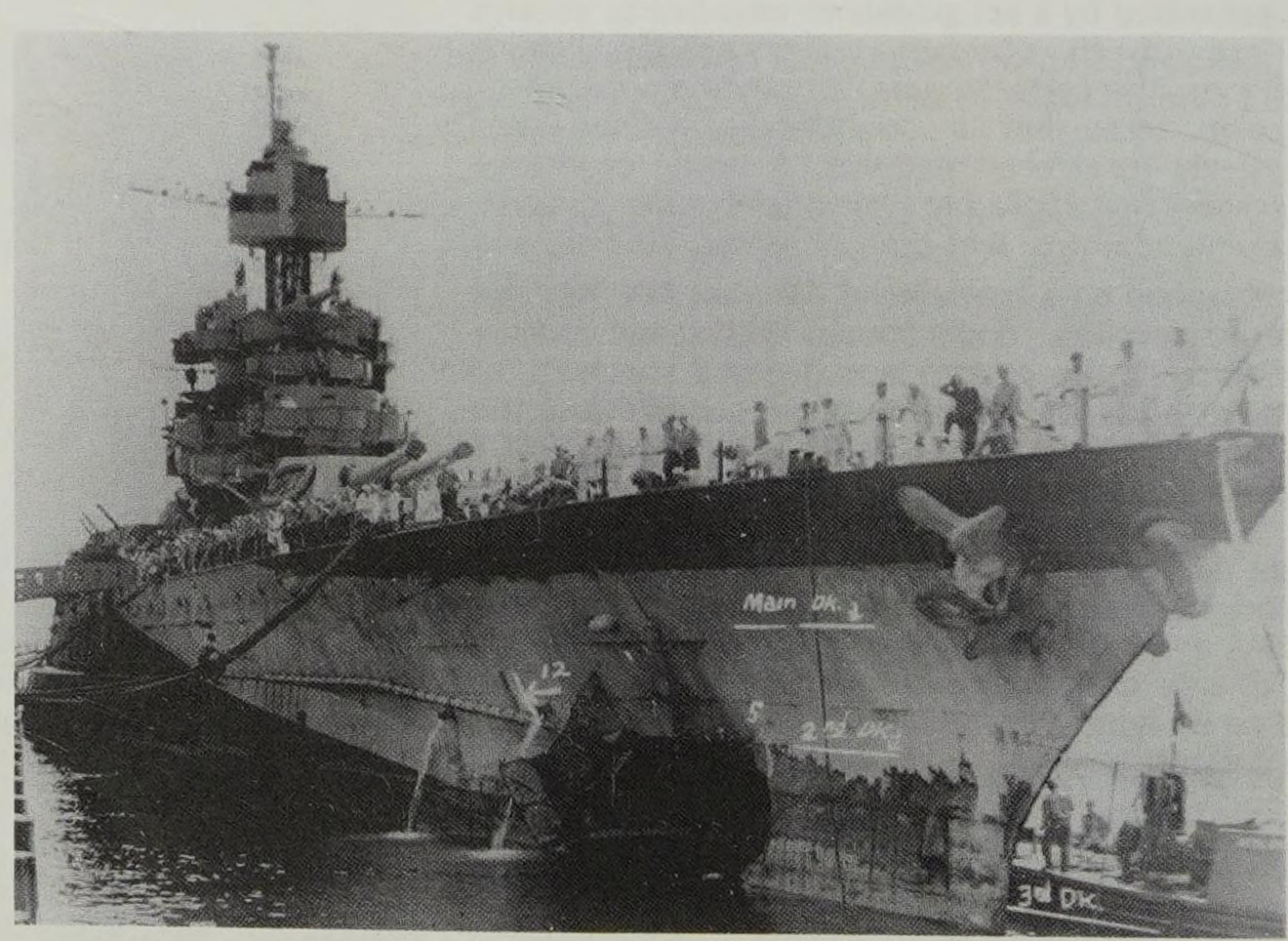


Right: Camouflage Sheets for the BB43 class ships. Example of the type of Camouflage Drawings used to apply a specific pattern to a specific class of ship. The drawings were only produced after the effectiveness of the pattern was evaluated by the Camouflage Section of the Bureau of Construction and Repair. Each pattern was generated by a set guidelines intended to deceive the eye of an observer under specific lighting conditions. The patterns were not random applications of color areas but a scientifically defined, and extensively researched patterns. A newly developed pattern was first applied to scale model of the ship type it was intended for, and then observed, studied, and photographed on a turntable at different bearings and angles of elevation, under various lighting and visibility conditions. If the pattern was deemed successful at this point plans were drawn up and submitted to the fleet for use. The pattern shown in the example is a Measure 32 Medium Pattern System, Design 16d (the "d" is for Destroyer type). The letter suffix on the design number indicated the type of ship the pattern was originally developed for with a=CV b=BB c=CB CA CL CLAA d=DD DE). Different ship type designs, notable the "d" type designs patterns were often redrawn and used on BB types. The CB type ships carried "c" cruiser type designs.

Summary of damages sustain by US Battleships in World War II

Ship	date	damage	repair time
AG16	7 Dec 41	2/3aerial torpedoes	capsized not raised
AG17	None		
BB33:	None		
BB34:	14 Apr 45	1 kamikaze	neg damage
BB35:	None		
BB36	7 Dec 41	sunk: 5 bombs 1 torpedo	5 mos
BB36	27 Mar 45	1 kamikaze	min damage
BB37	7 Dec 41	4 aerial torpedoes	salvaged not repaired
BB38	7 Dec 41	1 250lb bomb	min damage
BB38	12 Aug 45	1 aerial torpedo	not fully repaired
BB39	7 Dec 41	8 bombs 1 torpedo	sunk total loss
BB40	6 Jan 44	1 kamikaze	min damage
BB40	12 May 45	1 kamikaze	1 mo
BB41	9 Jan 44	1 kamikaze	min damage
BB41	5 Jun 45	1 kamikaze	min damage
BB42	12 Apr 45	1 kamikaze	min damage
BB43	7 Dec 41	2 bombs	min damage
BB43	12 Jun44	5 4.7" Shells	min damage
BB43	12 Apr 45	1 kamikaze	min damage
BB44	7 Dec 41	2 aerial torpedoes, sunk	3.5 mos
BB44	6 Jan 45	1 kamikaze	2 mos
BB45	24 Jul 44	22 hits 4.7"shells	4 mos
BB45	27 Nov 44	2 kamikazes	neg damage
BB46	7 Dec 41	2 bombs	1 mo
BB46	22 Jun 43	1 aerial torpedo	2 mos
BB46	29 Nov 44	1 kamikaze	1 mos
BB46	7 Apr 45	1 kamikaze	overhaul
BB48	7 Dec 41	7/8 aerial torpedoes 2 bombs	34 mos
BB48	17 Jun 45	1 kamikaze	min damage
BB55	14 Sep 42	1 submarine torpedo	2 mos
BB56	30 Jan 43	collision with BB58	5 mos
BB57	25 Oct 42	1 500lb Bomb	1 mo
BB57	14 Nov 42	2 shell 4.7"-14"	4 mos
BB58	30 Jan 43	collision with BB56	5 mos
BB59	8 Nov 42	2-240mm shells	neg damage
BB60	None		
BB61	18 Mar 44	2 4.7" shells	min damage
BB62	None		
BB63	11 Apr 45	1 kamikaze	min damage
CB1	None		
CB2	None		

min- minimal neg-negligible



Right: 10 Jul 1944 Pearl Harbor NSY. BB46 entering drydock for temporary repairs of aerial torpedo damage sustained on 22 Jun 1944. Received during operations off Saipan. USN BB designs had excellent protection systems, as good, or better than any other nations. As a result USN BB's absorbed battle damage that would have sunk or seriously damaged beyond repair many foreign designs. The USN also had outstanding fire and damage control training programs and Damage Control Teams who were very adept at the rapid containment and temporary correction of any damages sustained.

USN Shipyards Assignments and Activities 1909-1963

Private Shipyard Builders

Fore River Shipbuilding Co	Quincy MA	BB36 CC1/CV2
Bethlehem Steel Co	Quincy MA	BB59 (BB54)
Wm Cramp & Sons	Philadelphia PA	BB32/AG17
New York Shipbuilding Co	Camden NJ	BB31/AG16 BB33 BB37 BB42 BB45 (BB47) CC3/CV3 BB57 CB1 CB2 (CB3-CB6)
Newport News Shipbuilding	Newport News VA	BB35 BB38 BB41 BB46 (BB53) (CC2) (CC4) BB58

Naval Shipyard Builders

Mare Island NSY	Vallejo CA	BB44 (BB51)
New York NSY	Brooklyn NY	BB34 BB39 BB40 BB43 (BB49) (BB50 BB55 BB61 BB63 (BB69) (BB70)
Philadelphia NSY	Philadelphia PA	(CC5) (CC6) BB56 BB62 BB 64 (BB65) (BB66) (BB67) (BB68)
Norfolk NSY	Portsmouth VA	(BB 52) BB60 (BB66) (BB71)

( ) denotes canceled/uncompleted ships

Modernization Yards 1922-1941

Boston NSY	BB31
Norfolk NSY	AG16 BB34 BB35 BB36 BB39 BB41 BB42
Philadelphia NSY	AG17 BB33 BB37 BB38 BB40

Modernization Yards 1942-1963

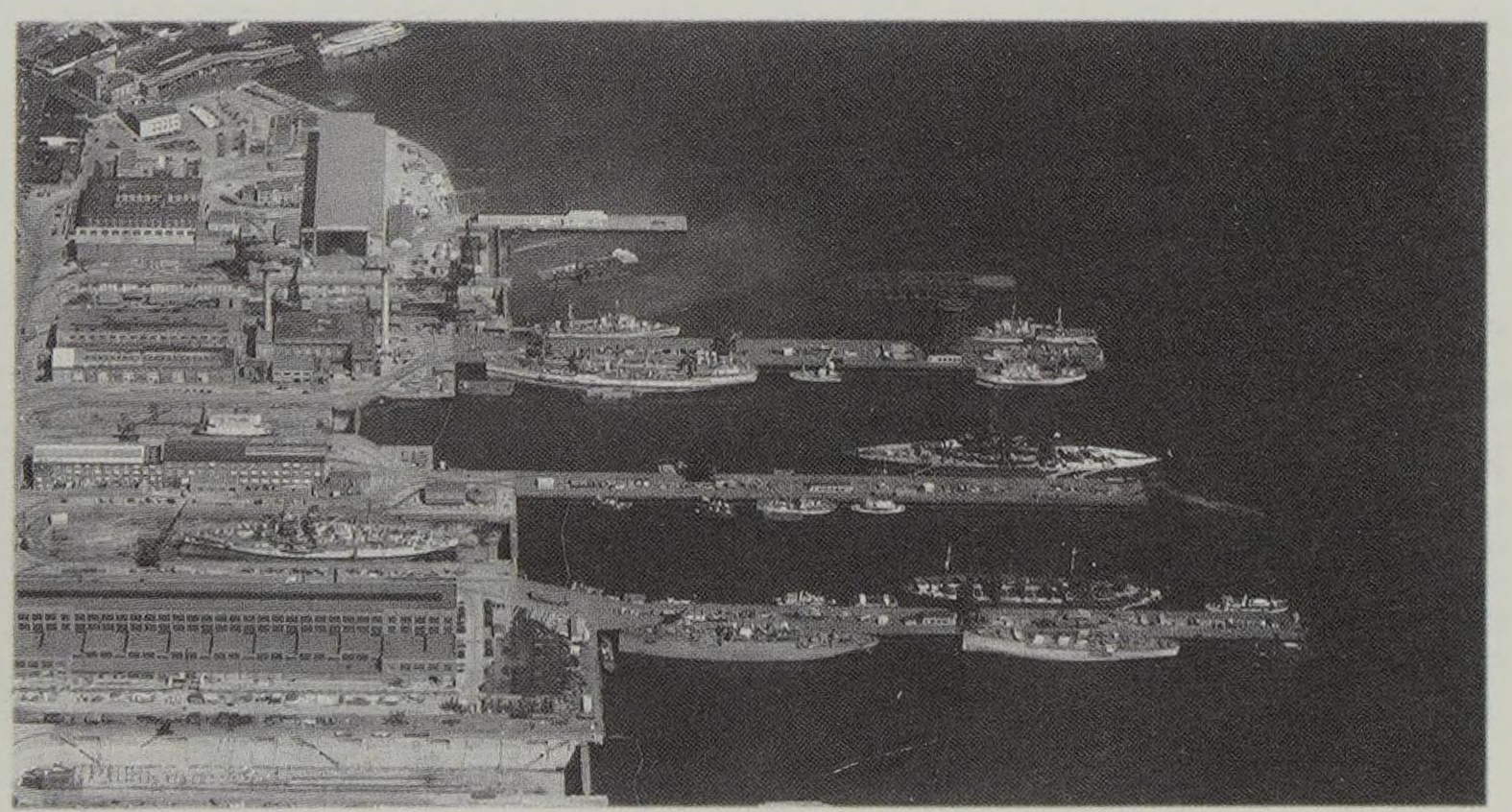
Mare Island	BB38
Norfolk NSY	AG17 AG128
Puget Sound	BB36 BB38 BB42 BB43BB44 BB45 BB46 BB48

Reserve Groups 1946-1963

Puget Sound NSY	BB45 BB46 BB58 BB60 BB63
Hunters Point NSY	BB61 (1948-1951)
Norfolk NSY	BB59 BB42 (BB66)
Bayonne Annex	BB55 BB56 (BB62 BB64 1957-1962) CB1 CB2
Philadelphia NSY	BB61 (BB62 BB64 1962-1963) (CB3)
Boston NSY	BB40

Scrapping Yards 1946-1963

Lipsett Co. /Luria Bros	Newark	BB32/AG17 BB40 BB42
Lipsett Co. /Luria Bros	Kearny NJ	BB56 BB57 CB1
Boston Metals	Baltimore MD	BB44 (CB3) (BB66)
Boston Metals	Newark NJ	CB2
Bethlehem Steel Co	Baltimore MD	BB41/AG128 BB43BB44
Todd Shipbuilding	Seattle WA	BB45 BB48
Todd Shipbuilding	Alameda CA	BB46
Nicolai Joffe Co	Richmond CA	BB58



25 Jul 1941 Puget Sound NSY. Note AG16 in drydock and USS Tennessee BB43 at the foot of the pier. BB43 rejoined the Battlefleet at Pearl Harbor on 12 Aug 1941. While stationed at Pearl Harbor 1940-1941 the BB's were cycled thru refits at Puget Sound NSY. Puget Sound NSY was the primary BB repair and overhaul base on the Pacific Coast from 1919-1955. Norfolk NSY was the East Coast counterpart.

Radars and Fire Control Directors Deployed on USN Capital ships

Section I Air and Surface Search Radars

The development and tactical use of advanced radar systems just prior to WWII was one of the greatest war impacting technologies which enabled the Allies to win WWII. Thus radar remained highly classified for the duration of WWII. All released photographs during the WWII era of USN ships had the all evidence of radar antennas airbrushed out by a censor. The USN developed some the most technologically advanced radar systems that were deployed during WWII. USN search radars were design to give early warning of hostile air and surface targets by manual detection and identification of targets via visual fluorescent A and B scope displays. They also provided approximate target positional information providing range and bearing input data to the precision fire control tracking systems. Search radars were also used to acquire navigation information and the relative positions of friendly air and surface units to maintain station keeping at night or in reduced visibility conditions. They also providing vectoring information for air interception of hostile air targets. Automatic IFF (Identification Friend/Foe) radar equipment became available in 1942 to aid the positive identification of friendly aircraft and ships. IFF employed a transmitter aboard a ship or aircraft broadcasting a specified changeable IFF code with a corresponding shipboard decoding receiving set. Early design search radars were intended to perform the dual functions of both air and surface search. Early radar systems relied on the limited capabilities of the type CXAM CXAM1 and SG sets for all search functions. As radar technology advanced it became possible by 1943 to design specialized separate air and surface search systems that were optimized for specific angles of search. Early dedicated air search sets SC's and the later SK/SK2 types were generally mounted atop the foremast on BB types. In late 1944 the USN developed the type SP specialized zenith (overhead) search and fighter direction control radar. These specialized types were fitted to the mainmast as a small parabolic dish. The SP's provided coverage in sky areas left unmonitored by other rotating fan beam air search radars (SC/SK/SK2). The SP sets also provided angle of target elevation input data for computing an air target's altitude.

The installation of search radars commenced with BB35 in Dec 1938 which was fitted with a large square antenna type XAF experimental search radar set mounted on the forward bridge superstructure. By Aug 1940 the improved large rectangular antenna CXAM became operational and was installed atop the foretops on BB44 and BB48. Starting in 1942 all USN BB's received the improved CXAM1/SC1 sets. Commencing in 1943 new large rectangular antenna (bedspring) SK type air search sets were mounted atop the foremast on 3rd generation and modernized 2nd generation ships. The existing SG set was relocated to small platform on the front of the fire control tower. Starting in mid 1944 the SG set was generally relocated to a rearward cantilevered foremast extension to provide 360 ° coverage, and a 2nd SG set installed atop the mainmast. Unmodernized 2nd generation and 1st generation BB's were fitted with an SK air search set on either the mainmast or the foremast. Mk3's for target acquisition were installed atop the conning towers on several early 3rd generation ships and replaced with the Mk27 prior to 1945. Large Parabolic Dish SK2 sets were fitted displacing the earlier SK sets starting in late 1944. BB63 was the 1st USN BB so equipped having completed in Jul 1944 with an SK2 set installed.

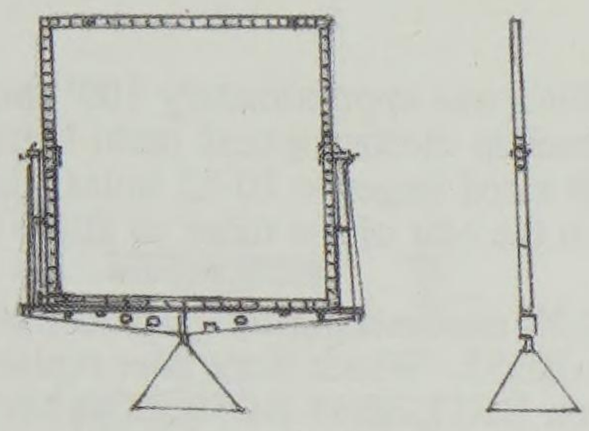
In postwar refits the BB61 class had their SG surface search sets replaced with an AN/SPS10 and the SK/SK2 air search sets replaced with AN/SPS6. An SP2 type was fitted to a rearward cantilevering mainmast attached to the aft stack (except for BB64 which retained a polemast with an SC4 set). In 1954-55 the type SP/SC sets were replaced with AN/SPS8A height finder mounted atop 4 leg lattice type mast attached to the aft stack.

Upon conversion to a gunnery training ship in 1947 AG128 was fitted with a SX type 3D air search set (which provided azimuth and elevation data from a single rotating antenna array) atop a new tripod mainmast with an AN/SPS6 atop the foremast.

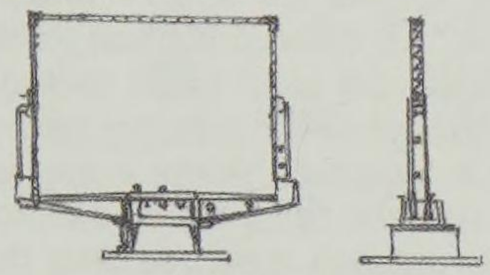
Primary USN BB Search Radar Systems

Air/Surface	XAF	1938	BB35 only 1938-1939
	CXZ	1938	BB34 only 1939-1940
	CXAM	1940	BB44 BB48 only Oct -Dec 1941
	CXAM-1	1941	BB35 BB38 BB48 BB55 BB56 1941-1942
Surface search	SRA/MK3	1942	also employed in Fire Cntrl
	SG1-6	1942	Primary Surface 1942-1949
	AN/SPS10	1947	Primary Surface Search BB61-BB64 1950-1964
Air Search	SC	1941	Replaced by SC2 BB55 BB56 BB57 BB58 1942-1943
	SC2	1942	Replaced by SK BB59 BB60
	SK/SK1	1943-46	Primary USN air search radar 1943-1945 All BB's CB's except BB63
	SK2	1944	Superseded the SK type 1944-1948 BB55 BB59 BB60 BB61-BB63
	SP6	1949	BB63 1949
	AN/SPS6	1950	BB61-BB64 1951-1958
Specialized Radars	SP/SP2	1944/46	Zenith Search
	AN/SPS8A	1954	BB61-BB64 only
3D Air Search	SX	1947	AG128 only 1947-1956

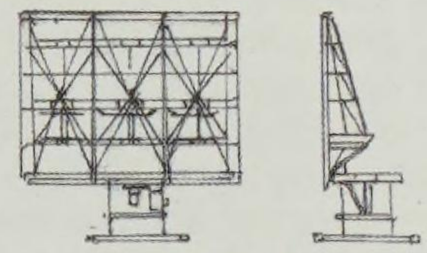
USN Capital Ship Air Search Antennas 1938-1958



XAF

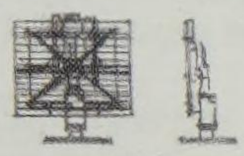


CXAM

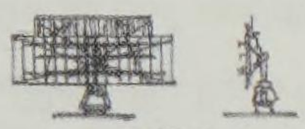


CXAM1

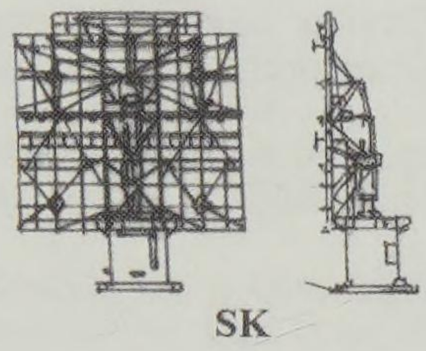
SG



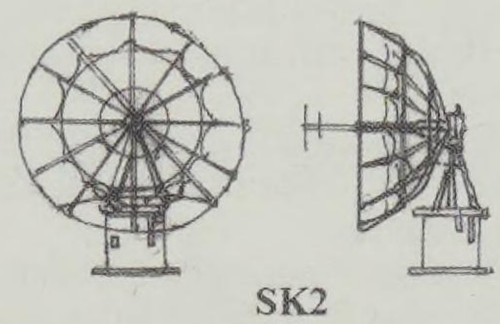
SC



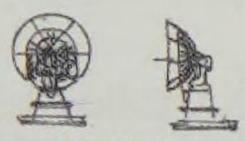
SC2-6



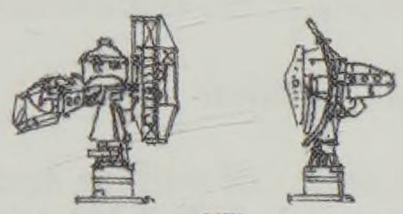
SK



SK2

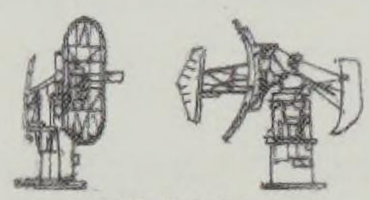


SP SP2



SX

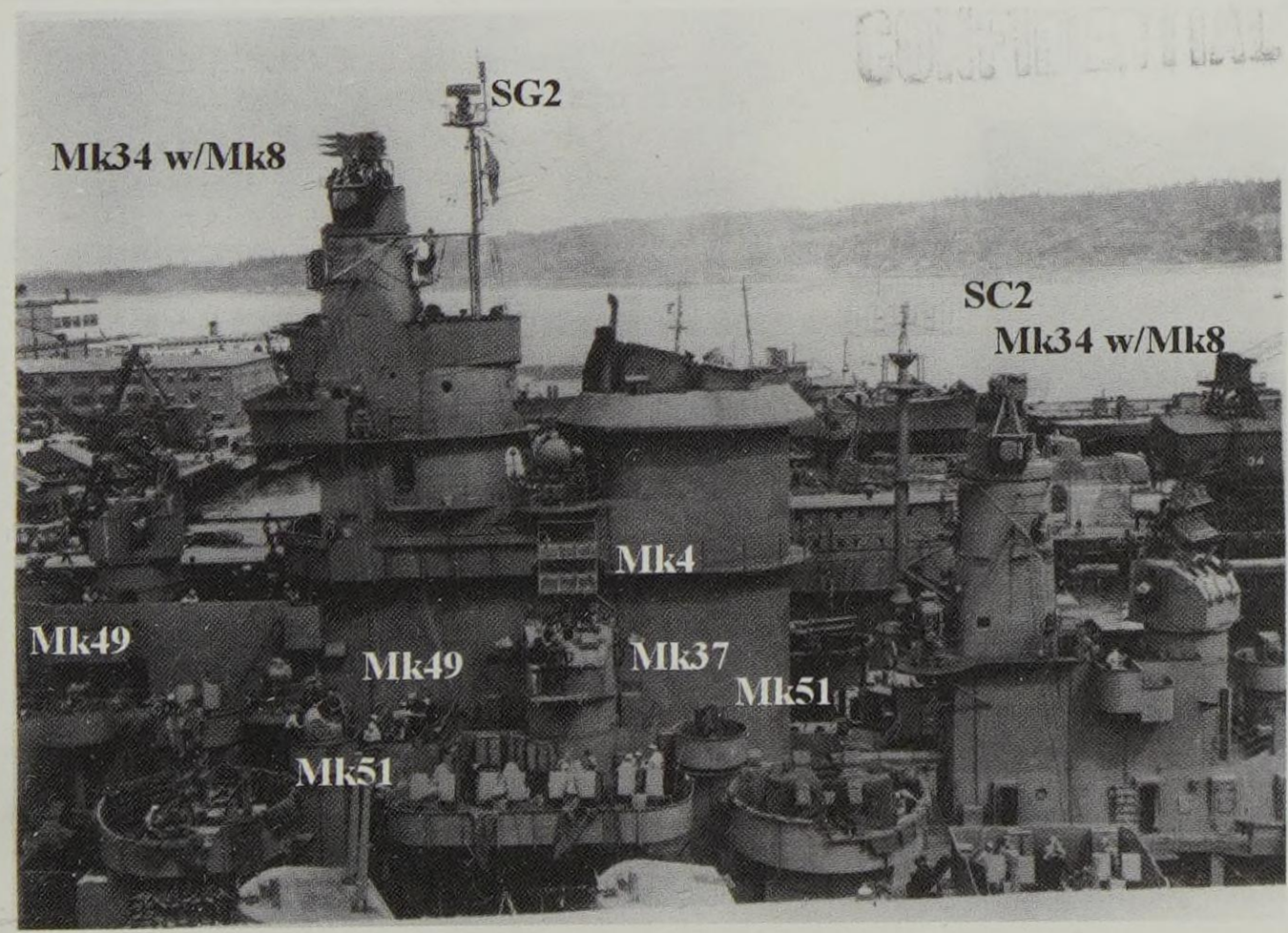
AN/SPS 6B



AN/SPS 8A

Section II Fire Control Systems

Precision control of gunfire by USN capital ships was provided by the most advanced radar and computational technology available during the WWII era. The overall targeting system was comprised of complimentary search and fire control tracking systems. Target detection and initial tracking was proved by manual lookouts, airborne/ground observers and/or electronic search systems (Search Radars). These 3 basic target detection and initial tracking directional systems operated in varying combinations and levels of interaction with one another to provide initial data input which provided target early warning, and approximate target location. Bearing, range, course, speed, and if an airborne target, altitude and elevation angle data inputs were provided to the Fire Control Direction Centers (Gunplots). Inputting to either a manual plotting board type (1st/ unmodified 2nd generation) or an electromechanical (MkIA) computing system (modernized 2nd/3rd generation). Extremely accurate semi automatic fire control systems would then 'lock on' and take over the precision tracking, computational and weapons aiming functions. The output of the Gunplot center would provide numerical offset values which could be transmitted verbally or automatically to the gun mounts of the weapons selected to engage a designated target. USN BB main armament fire control radars were so sensitive and accurate as to permit the tracking of in flight shells and to observe shell splashes on impact. BB46 used such shell splash returns from other BB's for ranging in order to achieve a fire control solution during the battle of Surigao Strait. The USN's precision fire control systems enabled USN Capital Ships to deliver the most accurate and precise gunfire of any nations ships, against any type targets during the WWII era. Three separate fire control systems were provided to control each functional level of caliber of the armaments aboard a BB. Main and secondary fire control systems on 3rd and modernized 2nd generation ships had the ability to interchange both Sinput and output data providing a cross control and backup capability in the event of systems failures or battledamage.



Left: 1 May 1943 Puget Sound NSY USS Tennessee BB43 illustrates the midwar USN BB radar and fire control systems suite. The forward SG was later replaced with an SK radar. Number and types of radars mounted on USN BB's would increase in number and the size and range of the sets. By mid 1942 radar had become essential to USN operations. The Axis Navies developed limited elementary radars to late have major impact on their operational capabilities. Axis fire control systems lacked the high levels sophistication of the Allied systems.

Main Armament Fire Direction

A primary electro/optical director was deployed atop the forward fire control tower which was approximately 100' above the waterline. Permitting tracking of BB sized surface targets out to 25+ miles. An after backup electro/optical main battery director located atop a shorter after fire control tower which offered surface tracking of a BB sized target to 10-12 miles. Each turret was equipped with a stereoscopic optical rangefinder for local turret control mounted on the rear of the turret to allow for optical local turret operation in the event of failure, or damage to the primary systems.

3rd generation designs employed a Mk38 Gunfire Control System comprised of 2 Mk38 stereoscopic rangefinders with Mk3mod1 radars with a rectangular antenna mounted atop the fire control directors on BB55-BB57. Which were later replaced with Mk3mod0 sets, which had a low wide rectangular antenna mounted atop the directors on BB57 BB58 BB59. The Mk3's were superseded by the Mk8, and postwar (BB61 class) by the Mk13 Fire Control Radars. On 3rd generation 3 MkI/Mk1a analog electro-mechanical computers were allocated one per turret. The 3rd generation system also employed 2 separate Centralized Main Gunplot Spaces located within the armored hull areas to house fire control computers and provide areas for Manual Gunplotters/ Remote Turret Control Equipment and Stable Element equipment (gyroscopic input which providing vertical 0° reference). The improved MkIA Gunfire control computer differed primarily from the preceding MkI by having AA elevation computational capability.

Modernized 2nd generation designs deployed systems generally similar to 3rd generation ships with the substitution of fitting a Mk34 with Mk8 radar main director. With 3 MkIA's assigned 1 each to the fore and aft main turret group and 1 assigned to the DP AA battery.

1st generation and unmodernized 2nd generation ships deployed 12'/15'/20' armored optical stereoscopic directors coupled with radar data inputs from and 1-2 Mk3mod0 radar sets mounted atop fighting tops to provide range and bearing data to a Manual Gunplot for main battery fire direction.

USN fire control directors were, from 1941 onwards, equipped with specific radars associated with a specific director system. Fire control radars were progressively replaced with improved models as the ships underwent overhaul.

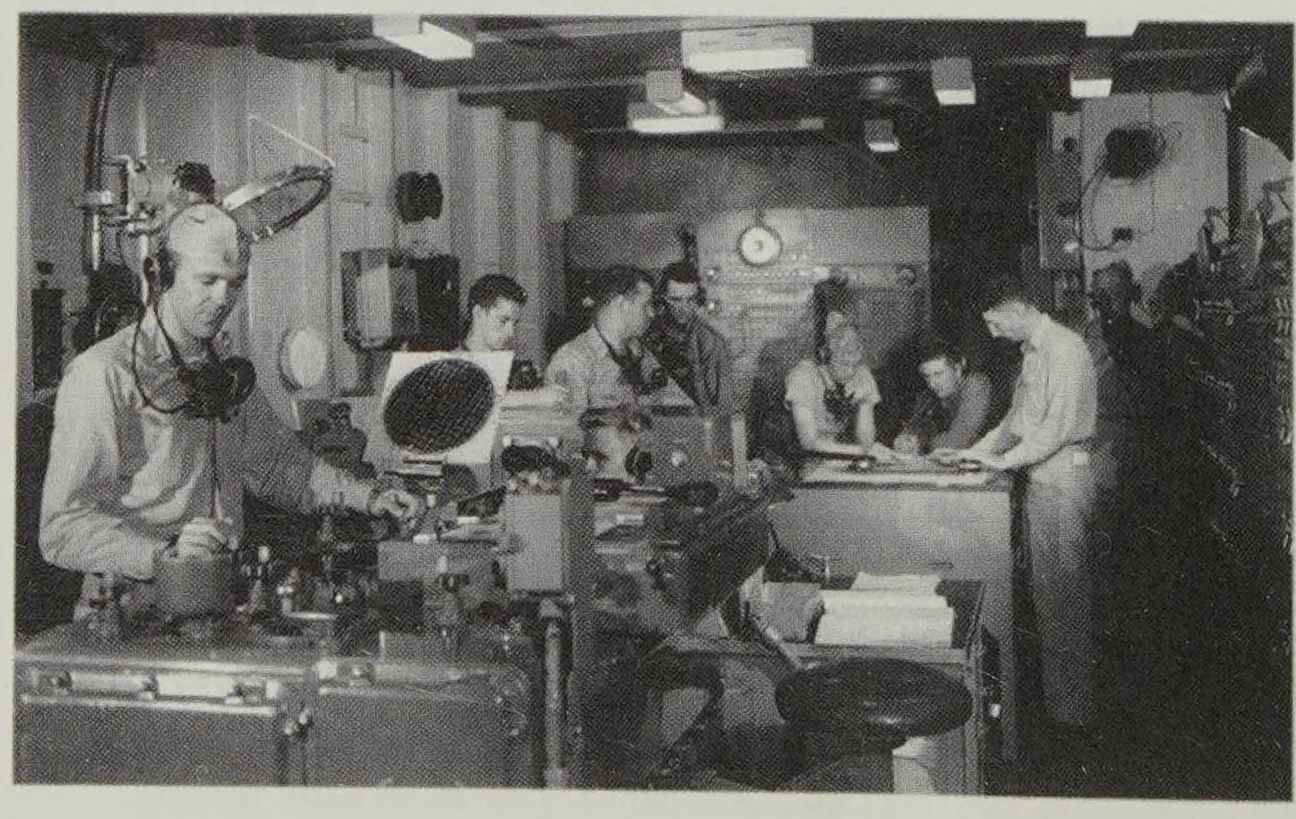
Secondary Armament Fire Direction

Modernized 2nd generation and 3rd generation designs fitted a series of surface secondary/AA (Mk19 Mk26) optical directors and/or Dual Purpose DP (air and surface targeting functions) secondary (Mk37) electro-optical directors. Mk3 Mod1 radars with a rectangular antenna were mounted atop the Mk19's on BB45 and BB46. The Mk4, later the Mk10 were fitted to the lower front of Mk28/31's directors on the BB40 class. The later standard type Mk37 DP directors were generally positioned in a 'diamond pattern' on the superstructure of 3rd generation, modernized 2nd generation ships. And on wings abaft the bridge on unmodernized 2nd generation ships. The 3rd generation and modernized 2nd generation designs also employed a 4th MkIA fire control computer to provide AA gun targeting solution data. Commencing in early 1942 Mk4 radars were installed atop Mk37 directors. In 1944 installation of a Mk22 Height Finder was co-located to the right side of the new Mk12 which an improved, almost identical appearing model of the earlier Mk4. The Mk22 allowed Horizon to Zenith target acquisition coverage permitting faster location of targets in elevation enabling earlier lock on and tracking, and shorten detection to engagement times. In late 1944 the 1st Generation BB's received 2 Mk50 directors with Mk10 radars to provide improved 3"/50 AA control.

Tertiary Armament Fire Direction:

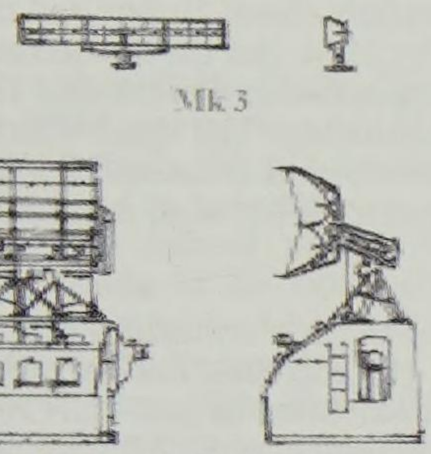
Medium AA A remote co-located optical gunsite and limited electromechanical computer was generally provided for each 1.1" and later 40mm quad mount (initially with the purely optical Mk51 directors and in refits after 1942 the radar equipped/ optical Mk57's with Mk19 radars). During postwar (1955) refits the BB61 BB62 had their Mk57's replaced with 6 electro/optical Mk56 with Mk35 radars AA directors.

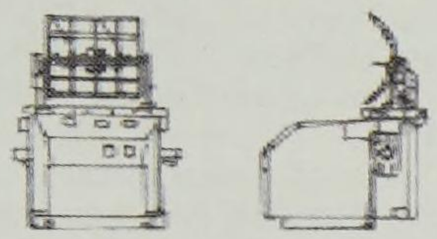
Light AA MG The .50 cal (1941/42) did not employ a semiautomatic fire control system, but employed manual optical 'ring sight' aiming. Nor did the successor 20mm's Oerlikons, which also primarily use optical 'ring sight' aiming, until 1943, when the Mk14 was fitted, later superseded in 1945 by the Mk15.

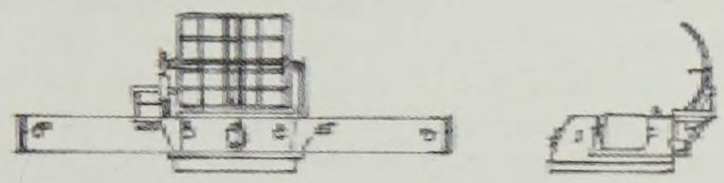


Left: Sep 1950 off Korea. USS Missouri BB63 main battery Gunplot. In the foreground is the Mk1A Rangekeeper which was an extremely accurate analog electro mechanical fire control computer. The Mk1A coupled with the extremely accurate USN tracking radars resulted in US BB's being the having the most accurate gunfire in WWII. The Mk1A's ability to direct accurate radar controlled 'blind fire' at night was proven by BB56 at Guadalcanal in Nov 1942, and again by BB43 BB44 and BB48 in Oct 1944 at Surigao Strait.

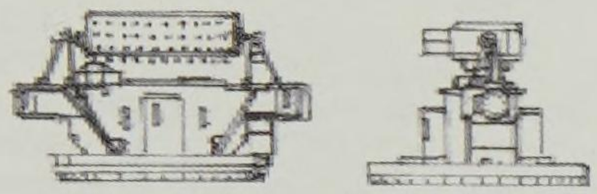
Fire Control Directors and Radar Systems

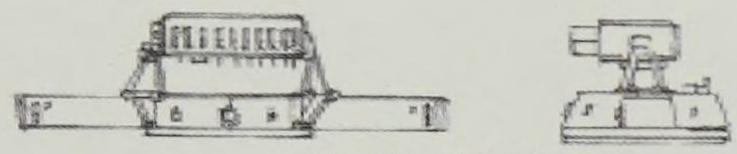

Mk 3

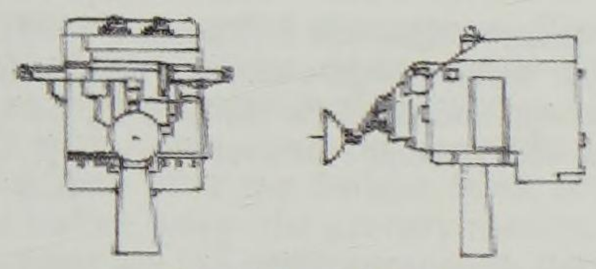

Mk19 w/ Mk3 Mod1

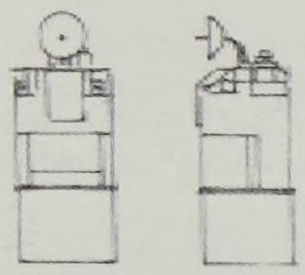

Mk 38 w/ Mk3 Mod1

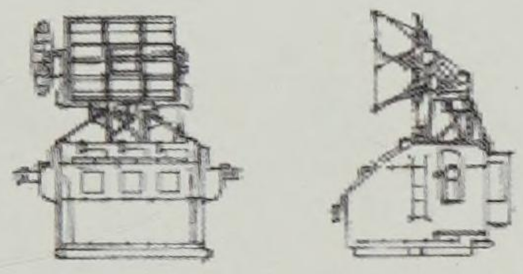
Mk 37 w/ Mk4 Mod0

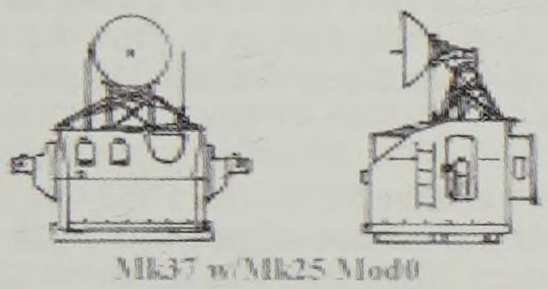

Mk 34 w/ Mk8 Mod0


Mk 38 w/ Mk8 Mod0

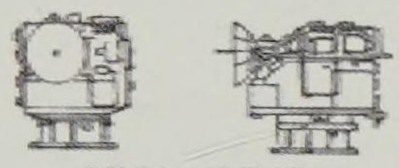

Mk 28/31 w/ MK10


Mk50 w/Mk10


MK37 w/MK12/22


MK37 w/MK25 Mod0

MK27


Mk56 w/ Mk35

Main Battery Directors 12"/14"/16"

Optical 12'/15'/20' armored rangefinders no radar	1st Generation /Unmodernized 2nd generation
Optical Mk36 coincidence type later replaced with Mk38 stereoscopic type	1st Generation /Unmodernized 2nd generation
Mk3 range and bearing radar	1st and unmodernized 2nd generation
Mk34 optical w/Mk8 radar	modernized 2nd generation
Mk38 optical w/Mk3 mod0/1 radar	3rd generation BB55-B58
Mk38 optical w/Mk8/Mk13 radar	3rd generation (Mk13 BB61 class only)

Secondary Surface (Casemate) 5"/51

Mk19	1st generation unmodernized 2nd generation
Mk28/Mk31 with MK4/10 radar	BB40 class

Secondary Heavy AA 5"/25 3"/50

Mk19w/Mk3mod1 radar (5"/25)	BB45 BB46
Mk28/Mk31 w/MK4/10 radar (5"/25)	BB40 class
Mk19 [Mk19 w/Mk3 mod1] (5"/25 3"/50)	BB33 BB34 BB35 [BB45] (1941-1944)
Mk50 w/Mk10 radars (3"/50)	BB33 BB34 BB35 (1944-1945)

DP AA directors 5"/38

Mk37 w/Mk4 or Mk12/22radar	modernized 2nd Generation/3rd generation
Mk33 w/Mk10 radar	BB42 (1945)
Mk37 w/ Mk4/ Mk12w/Mk 22 (5"/38)	modernized 2nd /3rd generation
Mk37 w/ Mk25 radars (5"/38)	BB61-BB64

Tertiary Medium AA 40mm

Mk49	BB62 (1945)
Mk5	1st -3rd Generation BB's
Mk56 w/Mk35 radar	BB61 BB62
Mk51	1st -3rd Generation BB's
Mk57w/Mk9 radar	BB61 class retro fitted to some 1st-3rd generation BB's

Light AA MG 20mm

Mk14/15	All USN BB's until 1952

Armament of USN Capital Ships 1941-1963

Overview: USN capital ships featured good to excellent overall armaments. The heavy 16" guns (Mk6/Mk7) of the 3rd generation of US capital ships were among the best artillery pieces in the world. The development of the excellent 5"/38 Dual Purpose (DP) gun permitted USN Capital Ships to provide a heavy secondary capability with the weight and space reductions inherent in a DP design. Only the USN and UK WWII BB designs incorporated DP secondary batteries. The inadequacies of the initial 1.1"/ .50 cal MG Medium/Light AA battery combination were quickly recognized. And subsequently corrected by the rapid introduction of 2 foreign design pieces; the Swedish 40mm Bofors and the Swiss 20mm Oerlikon. However, both the 40mm and the 20mm were obsolete in terms of striking power and range by 1944. But the replacement 3"/50 twin Mk27 mount was not ready for deployment until late 1946. Upgrades to 12 twin 3"/50 Mk33 mounts were authorized in the mid 1950's for the BB61 class (SCB74E), but the upgrade was not performed as the ships were scheduled for decommissioning. The quad 40mm mount remained the Medium AA battery for USN BB (in reduced numbers on BB61/64 13/14 quad mounts by 1956) until decommissioning in the 1950's. The massive single and twin mount 20mm batteries (up to 80+ mounts) deployed on USN capital ships in WWII was, in the late 1940's greatly reduced on active BB's and completed deleted on the BB61 class by 1952.

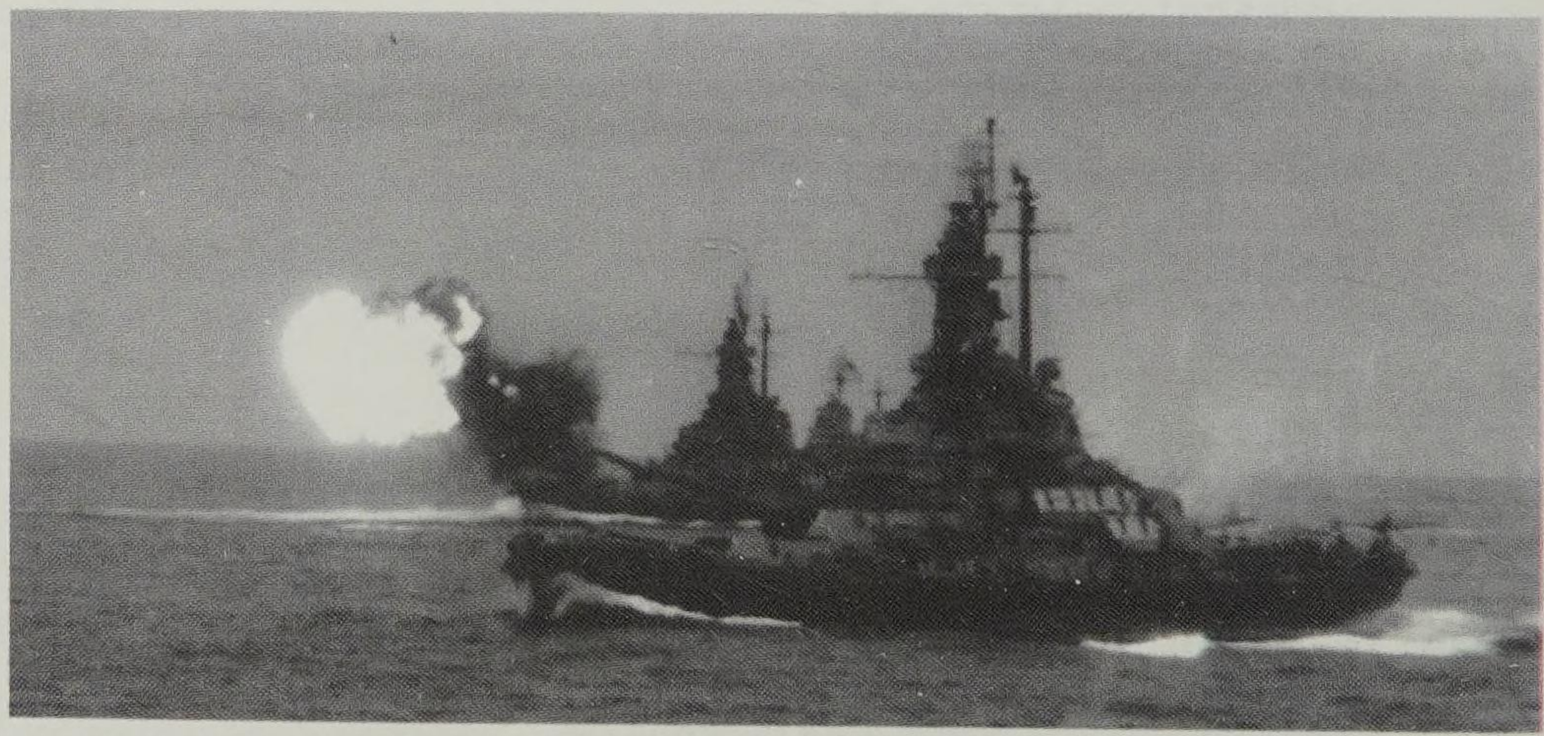
Main Armament: USN capital ships were equipped with 3 major calibers of main guns 12" 14" and 16" deployed in armored power operated twin or triple turret housings mounted atop heavily armored barbettes over armored magazine spaces. USN 1st generation designs featured 5-6 twin centerline turrets. 2nd generation featured 4 twin or triple centerline turrets. 3rd generation featured 3 triple centerline turrets. USN BB's never fitted wing turrets in their designs as it was felt they could not be given an adequate depth of protection and had limited arcs of fire restricting the available number of guns that could be brought to bear on a target. The only USN BB design with wing turrets were the 2 Moreno class BB's of 1910 built for Argentina. Ammunition handling and loading was power assisted with rear breach loading at 0°elevation.

Surface Secondary Armament: USN capital ship designs were equipped with 2 calibers of surface secondary armament 5"/51 and 6"/47. They were deployed singularly in either open or enclosed casemate mounts and were intended for use against surface targets exclusively. Enclosed casemate positions were generally lightly armored. The 6"/47 was never deployed but was scheduled for installation on the BB49 and CC1 class ships. The mounts were manually operated. Ammunition handling was power assisted from magazines with manual rear breech loading. USN BB's mounted 8/10 guns.

Heavy AA Secondary Armament: There were 2 calibers of Heavy AA fitted to 1st/2nd generation USN BB designs the 5"/25 and the 3"/50. The 5"/25 was an open mount AA gun mounted on BB36-BB45 class ships. As initially completed in open mounts on the 02 level they received 3 sided open topped splinter guntubs in 1939-40. The 3"/50 comprised the Heavy AA battery on the 1st generation BB's and 4 were fitted aboard the 2nd generation BB's. The open mount 5"/25 received 3 sided covered (open back) splinter shields (Pacific Shields) starting in Jan 1942. The mounts were manually or power operated. Ammunition handling was power assisted from magazines with manual rear loading via a sliding breech mechanism. USN BB's mounted 8/10 guns.

Dual Purpose DP Secondary Armament: Two calibers of DP guns were fitted to USN BB designs the 5"/38 and the 5"/54. The 5"/38 was Dual Purpose piece mounted in either single or twin enclosed mounts and were intended for use against both air and surface targets. The 5"/38 was deployed on all USN 3rd generation designs in 8/10 twin mounts ,and was retrofitted to 7 2nd generation ships BB36 BB38 BB43 BB44 BB45 BB46 BB48 each with 8-twin mounts and on BB42 in 10 single mounts. The 5"/54 was not operational deployed but planned to be fitted to the BB67 class ships. Two 5"/54 single mounts were fitted to the AG128. DP gunhouses were lightly armored providing basic splinter protection. The mounts were manually or power operated, ammunition handling was power assisted from magazines with manual sliding breech top loading.

Tertiary Armament: USN BB's were equipped with 2 calibers of medium AA guns the 1.1" and later the 40mm (1.6"). The 1.1" was intended for AA use and introduced on the BB55 design as completed. The 1.1" was deployed in quadruple barreled manually operated mounts (Chicago Organs) set in splinter protective 'gun tubs'. The USN designed 1.1" lacked reliability and effectiveness. It was in 1942 superseded by the Swedish designed license manufactured Bofors 40mm (1.6") piece. The 40mm was deployed in single, twin and quadruple barrel manually or power operated open mounts. 40mm's were usually mounted in 'gun tub' splinter shields. The quadruple mount on 3rd generation ships featured an open top and back 3 sided splinter shield. To save weight the shield was omitted in the 1st and 2nd generation ships. The 1.1 were replaced and the number of 40mm mounts increased when the 1st 2nd and early design 3rd generation ships were overhauled. 40mm and 1.1" ammunition was loaded manually in multi-round clips into a top loading breech mechanism. The 'ready round' ammunition storage were stored in boxes inside the walls of the gun tub splinter shields. Magazine to mount ammunition replenishment was manual. USN 1st and 2nd generation shipped 8-10 quad mounts and 3rd generation shipped 16-20 quad mounts.

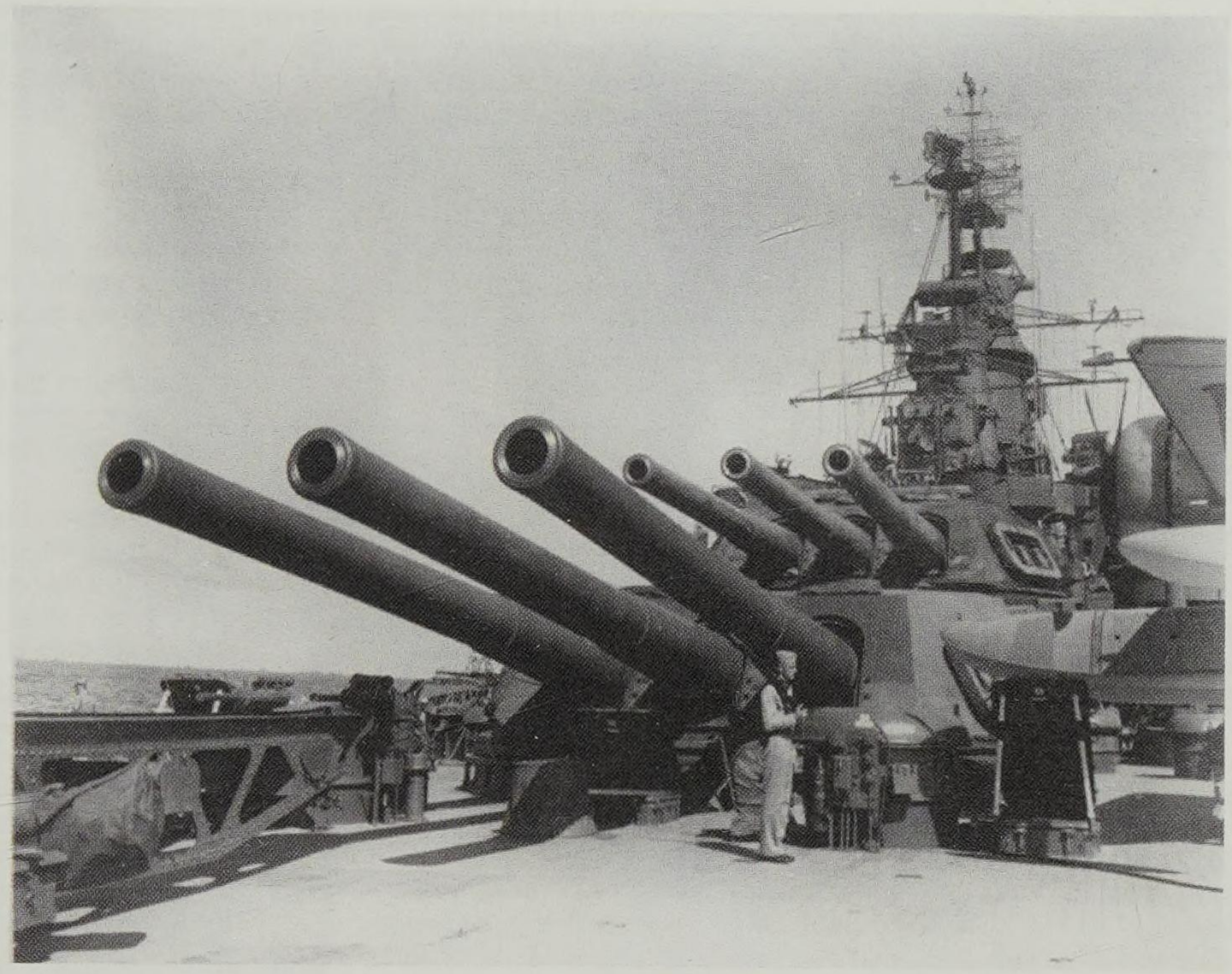


14 Jul 1945 USS Indiana BB58 foreground and USS South Dakota BB57 bombarding the Nippon Steel Works at Kamasihi Honshu Japan. BB bombardments were particular effective and demoralizing to civilian workers.

Light AA: Machine Gun Anti-Aircraft armament on USN BB's was of 2 calibers .50 cal (.50") and 20mm (.79"). In their 1920-1930's modernizations limited numbers of .50 caliber machine guns had been fitted to 1st /2nd generation ships in recognition of the growing threat of aerial attack. The .50 cal M2/M3 water or air cooled MG used belt feed ammunition that was handled manually and loaded manually. 'Ready Rounds' were stored in 'ready ammunition' boxes co-located with the often open, unshielded and exposed .50 cal mounts. Ammunition handling was from the magazines was manual. Some .50 mounts receive a splinter protection shield on the front of the mount and a guntub shield around the mount and ready ammunition boxes. During modernizations and refits the number of guns was progressively increased until mid-late 1942. Early 3rd generation designs also deployed the .50 cal MG on ships completed prior to late 1942 (BB55 BB56 BB57 BB58). The .50 cal fired a non-explosive round that by 1941 lacked the striking power and sufficient range required to effectively destroy contemporary aircraft. Commencing in early 1942 the Swiss designed license manufactured 20mm (.79") Oerlikon MG began replacing the .50cal MG. The 20mm was deployed with single or twin barrels open deck mounts, and were manually operated. They were deployed in large numbers aboard USN Capital Ships during WWII. 20mm's were mounted wherever deck space was available, in 'gun galleries' behind 3 sided splinter shields, or signally in individual guntubs. Ammunition handling was manual and the gun feed by a 'snaildrum' type of

magazine. The number of 20mm's was incrementally increased during modernizations and refits 1942-45. By 1945 the 20mm had also become obsolete in terms of hitting power and range. 20mm batteries were greatly reduced in postwar overhauls to help reduce manning levels. They were completely removed from active USN BB's by 1952. No replace for the 20mm MG was developed by the USN until the Phalanx 20mm Gatling gun of 1973. USN 1st generation and unmodernized 2nd generation shipped 30-40 20mm mounts. Modernized 2nd generation shipped 30-40 20mm mounts. 3rd generation shipped 60-80 20mm mounts.

Right: Circa Aug 1945. South China Sea. USS California BB44 operating with TF95. Note the massive 14" barrels, the SC1 Seahawk stored on a Dolly. BB's had to have their main gun barrels replaced to be relined periodically so turret roofs were made to be removable. This task could be performed at Advanced Bases and or Tenderside in the Forward Areas. To decrease gun barrel wear High Capacity (HC) shore bombardment rounds were fired using reduced powder charges. 1st and 2nd generation ships carried a minimal number of AP rounds as their primary fleet function was amphibious support fire. But they carried a maximum load of HC bombardment rounds. At the battle off Samar this ammunition load configuration and the fact that ships were low on main battery AP ammunition after the Surigao Strait action the night before were the primary reasons for not deploying the 2nd generation BB's assigned to the fire support group to intercept, and engage the attacking Japanese Battle Force . This coupled with the fact the modernized 2nd generation BB's lacked the speed, protection, and armament systems necessary to successfully engage a Yamato class BB.



USN Battleship Weapon and Ammunition Types 1941-1963

Class	Caliber	MK	AP/HC wht	Range AP/HC	rnds/minute
Main					
BB61 BB67	16"/50	Mk7	2,700/1,900	42345/41,622	2.0
BB61/64 Nuclear	16"/50	Mk23	1,900	40,000/42,345	1.0
BB55 BB57	16"/45	Mk6	2,700/1,900	39,000/40,180	2.0
BB45	16"/45	Mk5/8	2,240/1,900	40,200/40,180	1.5
BB40 BB43 (BB55)*	14"/50	Mk7/11	1,500/1,275	43,000/42,585	2.0
BB34 BB36 BB38	14"/45	Mk3/5	1,500/1,275	40,000/ -	1.5
CB1	12"/50	Mk8	1,140/945	38,573/38,021	2.0
BB32	12"/50	MK7	870/740	-/23,900	1.7
AG128	6"/47 DP	Mk16	130/105	26,111/23,483	16
*(BB55 original design scheme XVI)					
Secondary					
(BB49 CC1)	6"/53	Mk18	105/105	25,300/25300	7
BB33-BB48	5"/51	Mk14/15	50/50	18,800	9
BB36 BB38 BB42 BB44 BB46 BB48	5"/25	Mk13/17	53/51(AA)	14,500/1,400'AA	8
BB36 BB38 BB42 BB44 BB46 BB48 BB55-BB61	5"/38 DP	Mk12	54/55(AA)	17,392/37,200'AA	22
BB 67 AG128	5"/54	Mk16	69/69	25,909/51,600' AA	18
Tertiary					
BB31-BB35 (BB 49 CC1)	3"/50	Mk6/8	24(AA)	14,600/30,400' AA	20
AG16 AG17 BB48 BB55-BB57	1.1"/75	Mk1/2	1.9(AA)	17,400/19,000'AA	100
BB33-BB67	40mm/56	Mk1/2	1.9/2.0(AA)	11,133/22,299'AA	120
Light AA					
AG16 AG17 BB33-BB55	.50 cal	Mk2/3		2,000'/2500	550
AG17 BB33-BB67	20mm/70	Mk2/3/4	.27AA	4,800/10,000' AA	300
AG 128 1953-56	BW-0/1 Terrier SAM		1060	7nm/40,000' 10nm/40,000'	2/minute per launcher

Armor and Protective Systems

As with all the other facets of USN battleship design. Armor and Protective systems underwent an evolutionary improvement process. The world standard for concepts of advanced armored protection systems was led by the systems incorporated into USN BB designs. USN BB protective system designs were always at the forefront of the world's leading edge of protection technology at the time a given class of USN Capital Ship was designed. Unlike many foreign contemporary designs USN BB's always provided adequate protection at the sacrifice of few knots of speed. The three basic generations of protective systems defined the design generations of world battleship development. The basic philosophy of USN protective systems was to provide the widest possible immunity zone against gunfire of the same caliber as the ship's main armament in a optimum balanced ship design. However armor and protective systems were always a case of compromise. Technically the BB55 and the BB61 class ships were 'unbalanced designs', but they were outstanding ships nonetheless due to the USN's tendency to be very conservative in protective systems design.

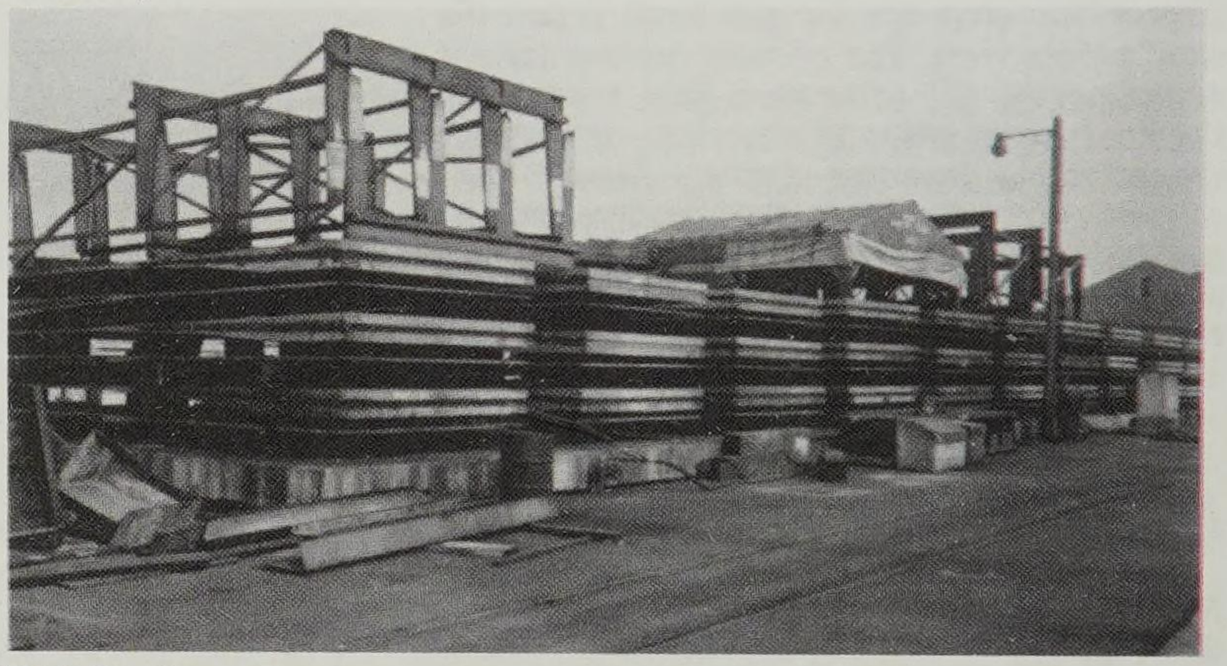
Side Protective Systems

First Generation: Relatively thin armor protection over large parts of the hull area with transverse armored bulkheads, and double bottom cofferdams. Most armor concentrated in a fore to aft waterline belt as protection against flat trajectory large caliber gunfire which was considered the primary threat in the period the ships were designed. Basically a continuation of the pre-dreadnaught protection systems concepts. Armor plate had no inclination from the vertical. (BB30 BB32 BB34 classes).

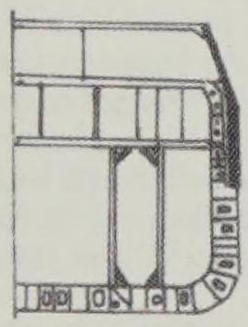
Second Generation: Incorporated "Raft Body" armored citadel concept of a maximum thickness waterline belt from turret 1 to turret 4 with transverse armored bulkheads fore and aft with relatively heavy horizontal protection over the citadel and double bottom cofferdams at the bottom of the citadel. USN battleships of the Nevada class introduced this concept in 1916. Armor plate had no inclination from the vertical. (BB36 BB38 BB40 BB43 BB45 BB49 CC1 classes).

Third Generation: Incorporated 'Raft Body' concept but introduced waterline belt vertical armor inclined inward at 15°-19° thereby increasing the effective thickness of the armor belt. Waterline belt also tapered towards bottom of ship becoming integral with the underwater torpedo protection system. Thickness of horizontal armor was increased against high angle gunfire and in somewhat latent recognition of the increasing destructive power of the aerial dropped bomb. (BB55 BB57 BB61 BB67 CB1).

Right: circa 1945 Philadelphia NSY. Side armor for BB65. Note the Layer/Sandwiched construction of the plates and the taper of the thickness that was set towards the bottom of the hull. The steel use by USN 3rd generation BB design was HY-80 (High Yield) and afforded the best protection characteristics of any armor plate used in WWII. US armor plate hardness was such that it was brittle and tended more towards shattering rather than deforming as did mild steel upon shell impact. Armor systems tended to be backed with mild steel backing bulkheads to absorb internal splinters (spaulding) from the armor plate.



Armor Systems by Class 1945 Configurations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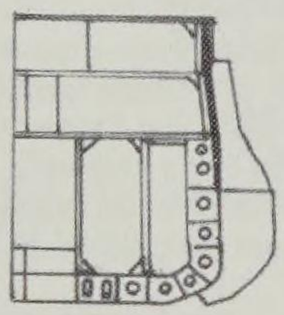
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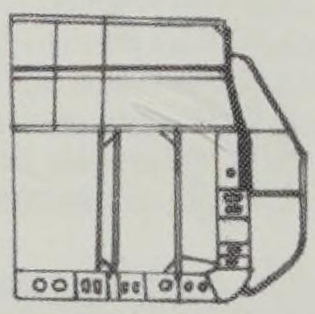
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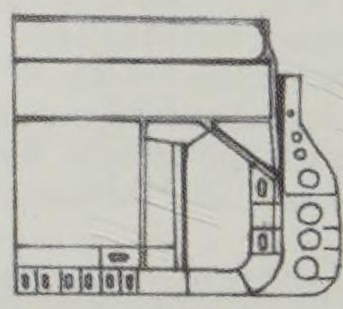
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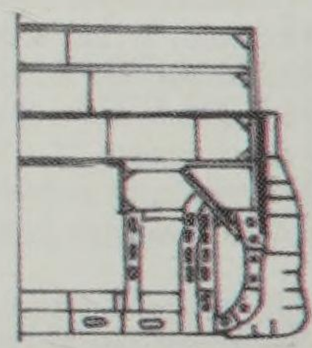
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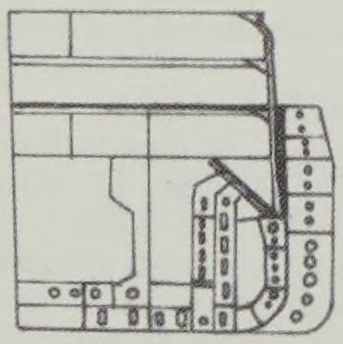
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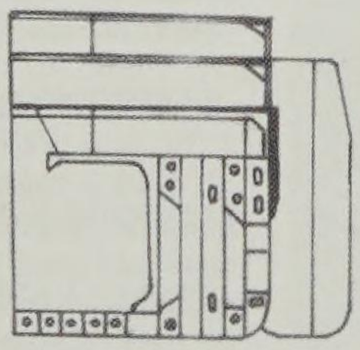
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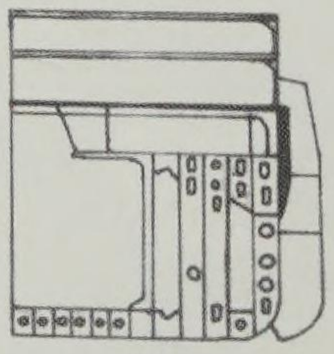
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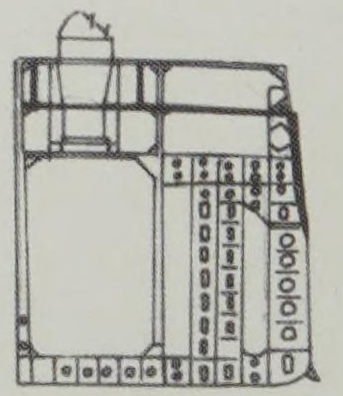
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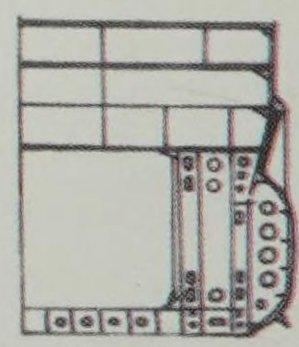
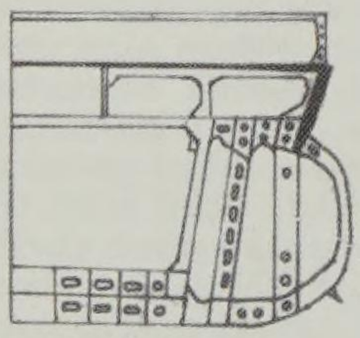

CC 1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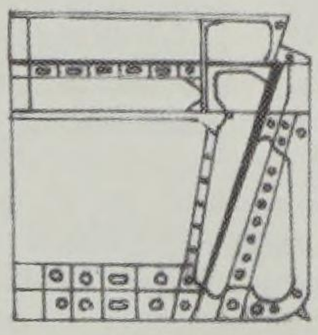
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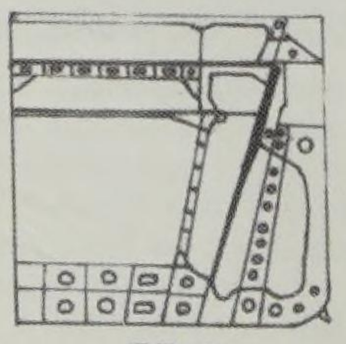
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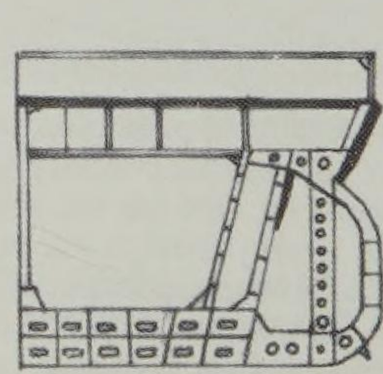
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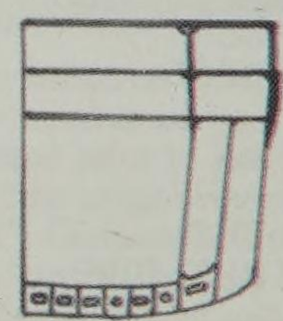
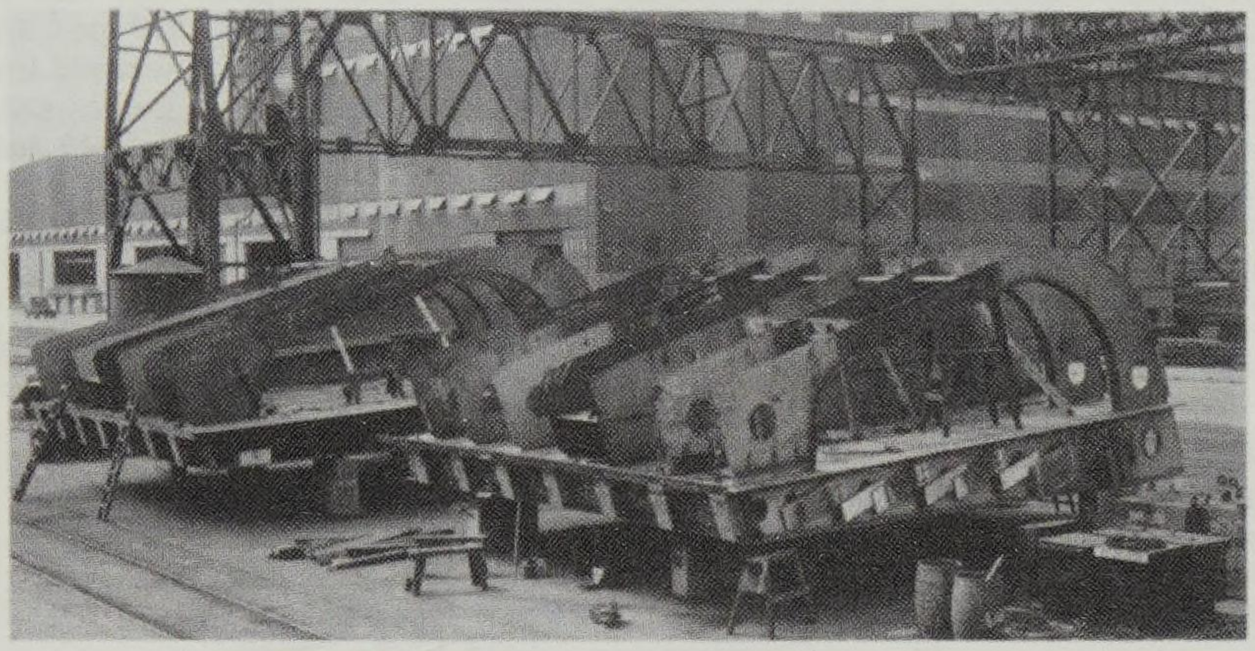

CB 1

Underwater Protective Systems

First Generation: Two longintunal torpedo bulkheads. Voids were originally intended to be coal loaded thus providing an addition protective layer. Blisters add during 1920s' refits and the depth of the blisters again increased during WWII refits. Full hull width transverse bulkheads for compartmentation. Double bottom cofferdams.

Second Generation: Number and depth of torpedo bulkheads increased. During 1930's modernizations blisters were added as well as addition unarmored vertical bulkheads creating 3-4 void spaces were added and kept alternately liquid and air filled. Later 2nd generation ships incorporated these features into their original designs. Addition blisters were applied during WWII modernizations. The blisters added to BB43 BB44 BB48 exceeded the beam dimensions required to transit the Panama Canal. Transverse bulkheads as in 1st generation BB's. Fitted with double bottom cofferdams.

Third Generation: Transverse depth of overall torpedo cofferdam increased. Waterline belt armor inclined and tapered to bottom of ship and incorporated into torpedo protection system. And 4-5 inclined mild steel bulkhead voids alternately liquid (oil) and air filled. Unpierced transverse bulkheads with double bottom cofferdams.



Right: circa 1945 Philadelphia NSY Torpedo side protection sections for the BB65 the wide end is installed toward hull the bottom.

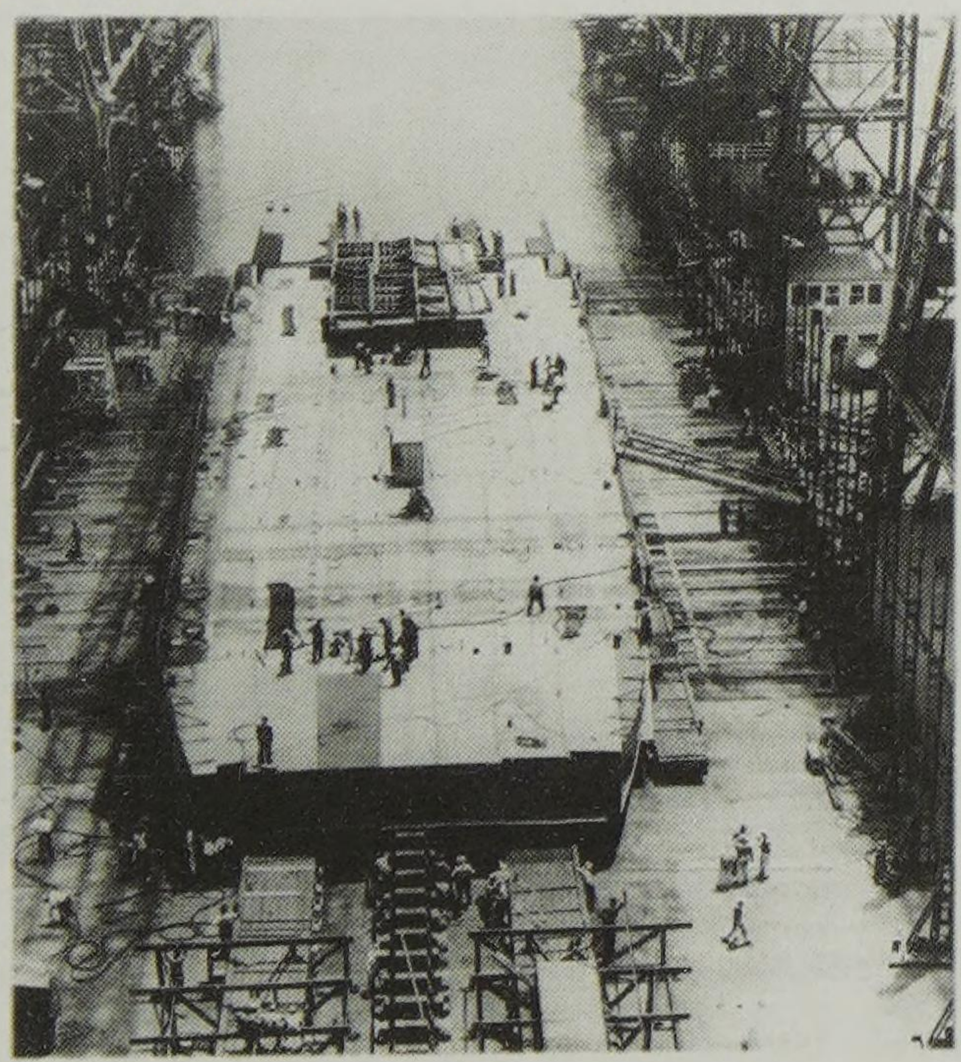
Horizontal Deck Protection Systems

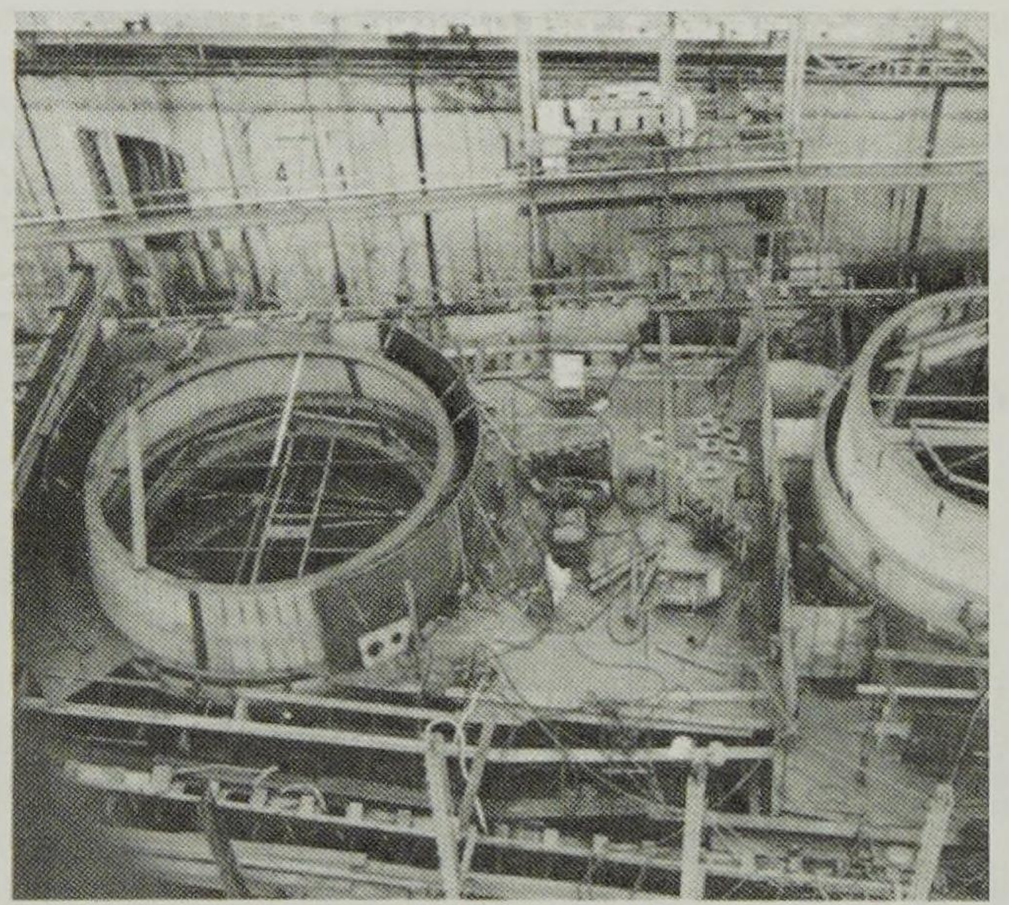
All generations of horizontal protection systems consisted of a combination of 2-3 decks of varying thickness of armor and 1-2 unarmored decks to decap and detonate an armor piercing high angle projectiles or bombs before they could penetrate the armored decks and detonate in the ship's vital areas. As the power and accuracy of long range high angle gunfire and bombing accuracy increased in the 1920-40's horizontal protection thickness was increased on 1st/2nd generation ships in both 1920/30's modernizations and increased again significantly during WWII modernization programs.

Hull Bottom Protection Systems

All generations of Hull Bottom Protection Systems were comprised of varying combinations of transverse and longintunal bulkheads contained within a double/triple bottom cofferdam. This provided limited protection against an under hull detonation of a mine of torpedo by limiting flooding patterns of a detonation. But due to the incompressible properties of water they were not designed to prevent an inner hull breach in the event of an under hull detonation. But as much as was possible, contain and dissipate the explosion energy and then to assist in the control of flooding patterns.

Below: 6 Jun 1942 Philadelphia NSY. USS Kentucky BB66 triple hull bottom being prepared to be 'launched' to clear the building way. Note the cofferdam construction..





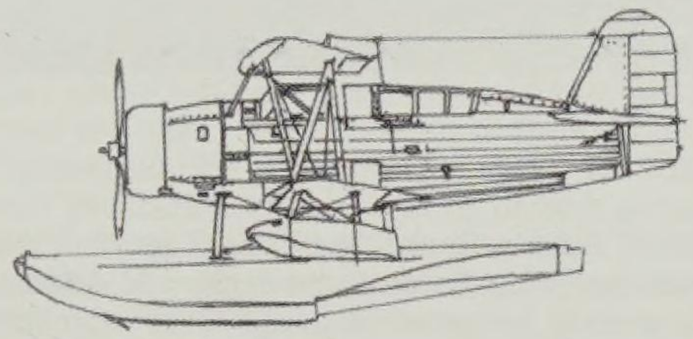
Above: 22 Oct 1945 Norfolk NSY. USS Kentucky BB66 forward barbettes and transverse bulkheads. Note the armor horizontal deck. And the thickness of the barbettes.

Aviation aboard USN Capital Ships 1941-1963

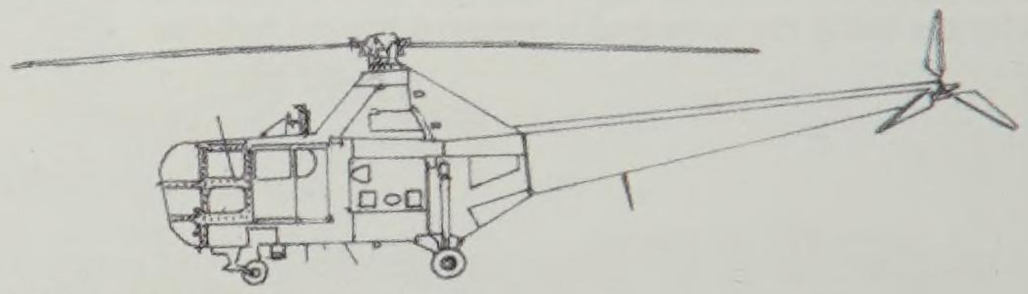
As completed USN 1st /2nd generation ships had no provisions for aircraft. In the immediate post WWI era some USN BB's were equipped with "Flying Off Platforms" atop the upper main gun turrets (BB36 BB37). These were employed to launch wheeled land based aircraft which could not be recovered aboard the ship, but had to land at an airfield. By 1923 the USN had developed a compressed air operated trainable fantail catapult for launching float planes. Which would land alongside the a stopped ship and be recovered by a fantail crane. Later a steel mesh "Towing Mat" was towed alongside, and snared a hook on the bottom of the center float on the aircraft which permitted the aircraft to be recovered while the ship was underway. By the mid-1930's the USN had developed the powder type catapult (a 5"powder cartridge was used) which allow them to be installed atop the number 3 main gun turrets during 1920's/1930's modernizations Starting in early 1942 turret mounted catapults were removed from all but BB33-BB35. Light aircraft "boom derrick style" cranes were initially added to the fantail, which were replaced in modernizations with heavier truss type cranes. Cranes were also added abaft the mainmast to handle aircraft for the turret top catapults. All USN 3rd generation BB's mounted 2 catapults 'side by side' port and starboard and a heavy duty "Truss Type" crane on the fantail. The CB1 class mounted their catapults on towers amidships aft of the forward firecontrol tower. No USN Capital Ships except the CB1 included aircraft hangers. Aircraft were stowed on the catapults or wheeled dollies secured to the fantail. Floatplanes were removed from the USN inventory in 1949. Catapults were removed for the BB61 and BB63 in 1949 and BB62 and BB64 when they were reactivated for Korea. The balance of the BB's in reserve retained them to scrapping.

After removal of the catapults the fantails of the BB61 class were used to operate helicopters. Helicopters were not permanently attached to the ships as were the floatplanes and they deployed aboard on a Temporary Duty basis.

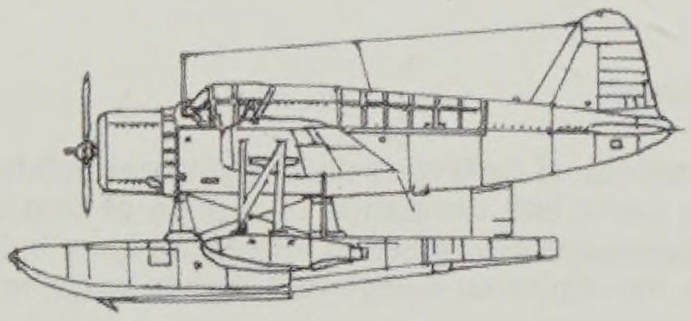
Aircraft Types deployed aboard USN Capital Ships 1941-1963



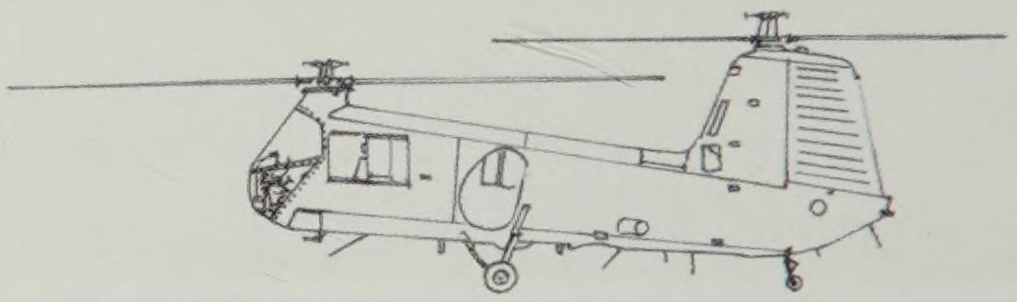
Curtiss SOC3 Seagull



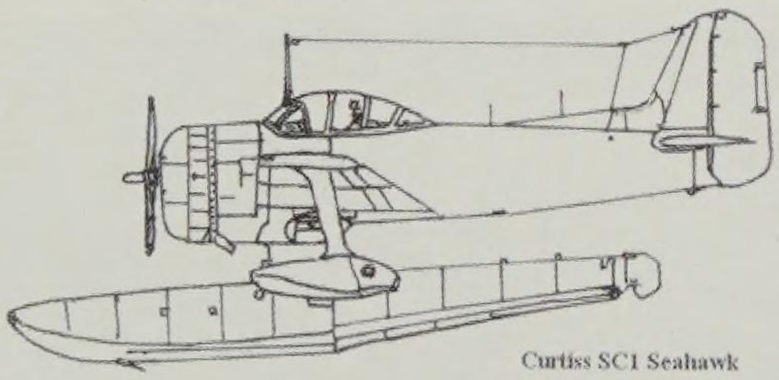
Sikorsky HO3S Dragonfly



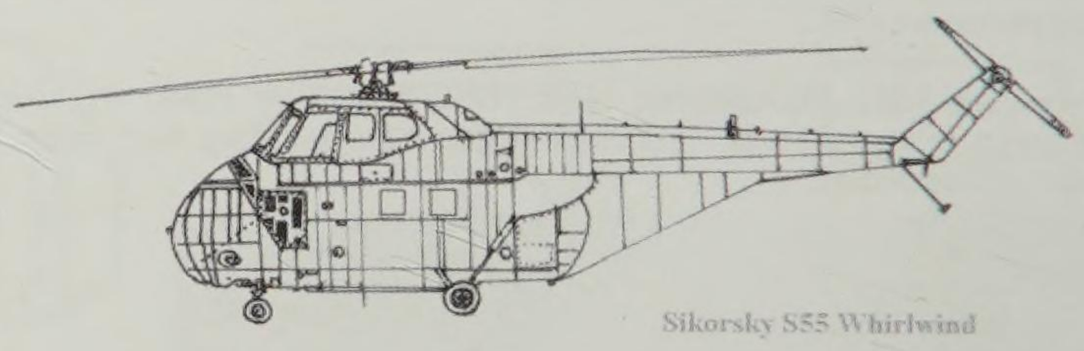
Vought O2SU Kingfisher



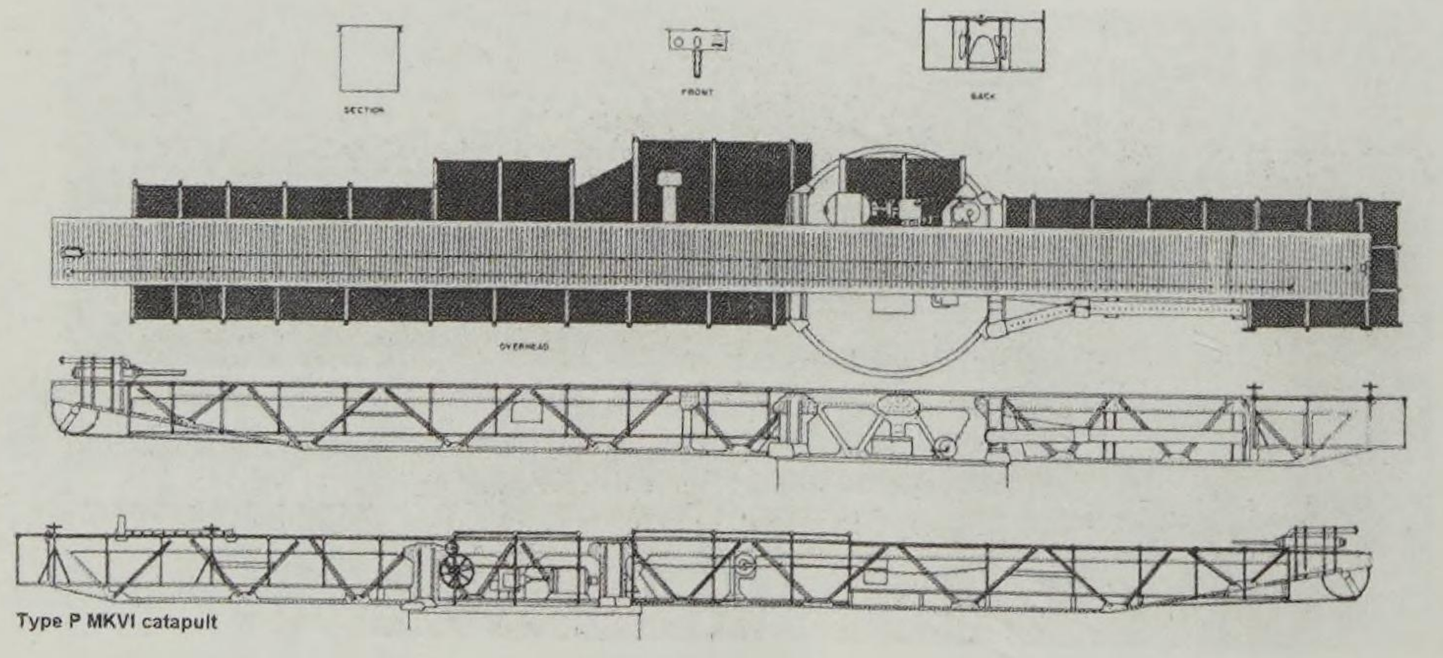
Piasecki HUP 1 Retriever



Curtiss SC1 Seahawk



Sikorsky S55 Whirlwind



Type P MKVI catapult

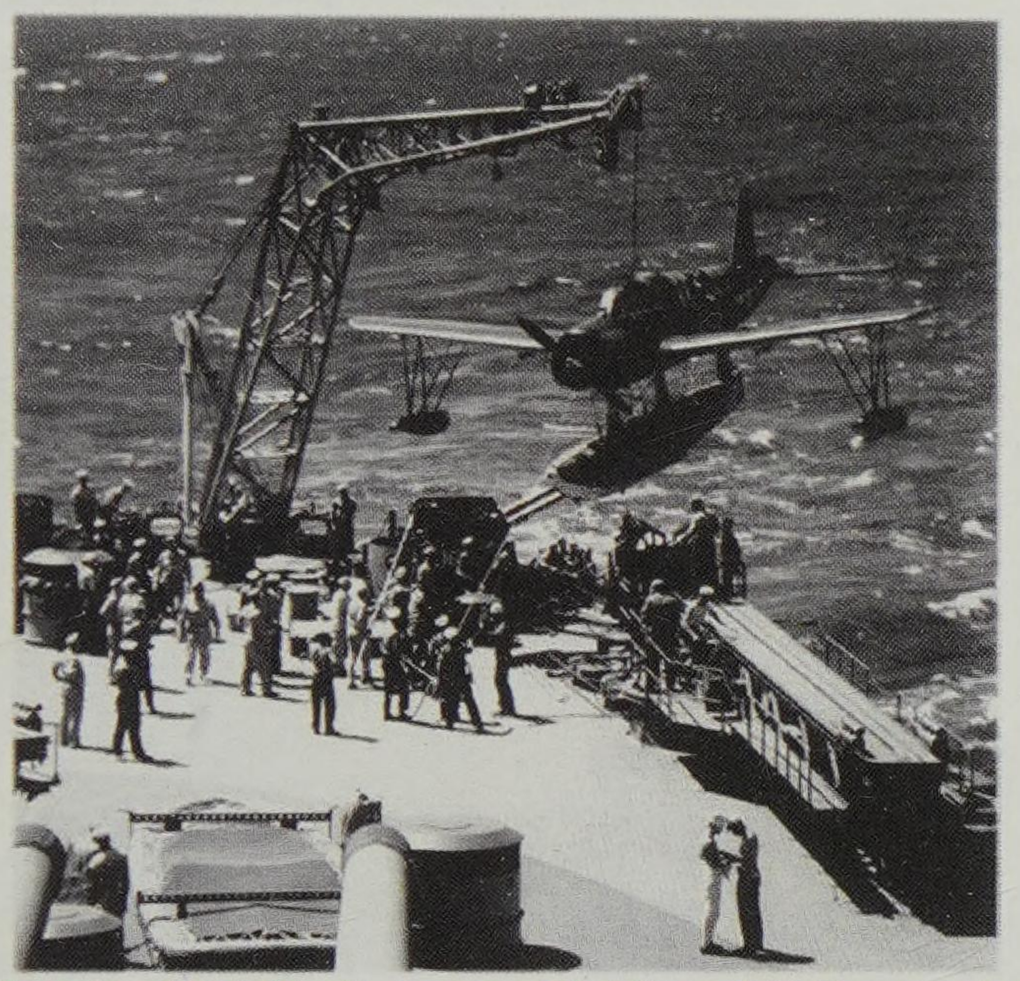
Catapult Configurations

BB33 BB34 BB35 BB36-BB46 BB48
1 type P MkIV/MkIVa mounted on fantail (1922-1946)

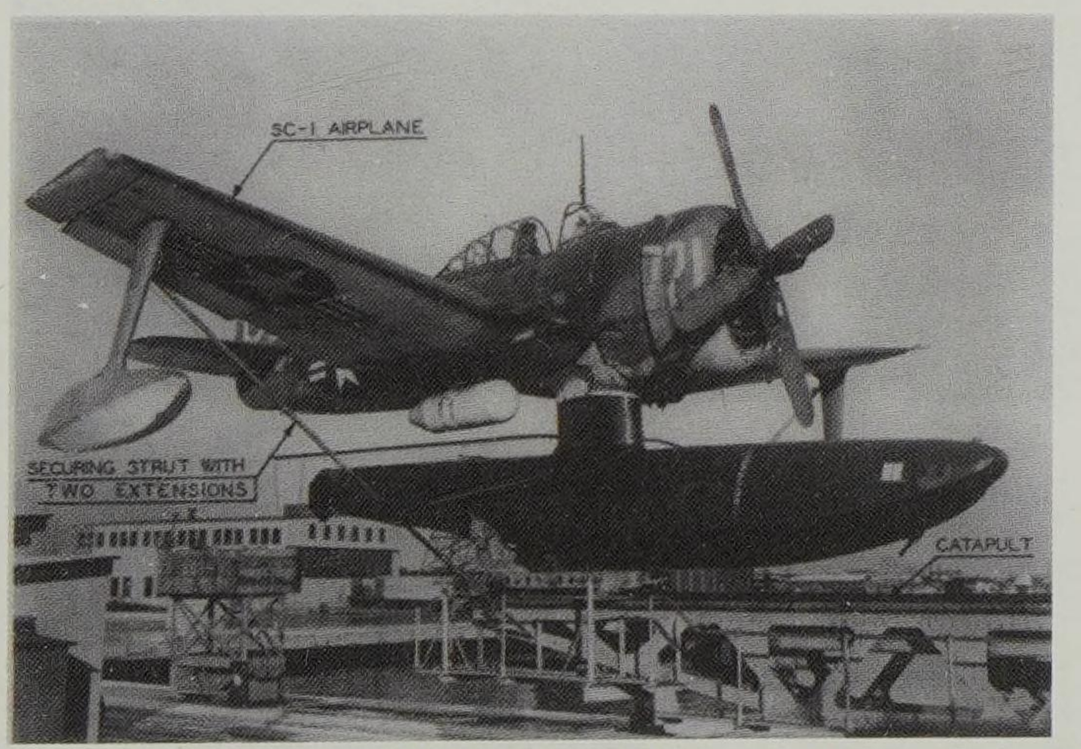
BB36-BB46 BB48
2 type P MkIV/MkIVa mounted atop turret 3 (1927-1942)

BB55-BB67 CB1
2 type P MKVI catapult mounted on fantail

The biplane Curtiss SOC1 Seagull was replaced on Pacific Fleet BB's by O2SU's in 1942. All BB's at Pearl Harbor carried O2SU's. The SOC's were retained by Atlantic Fleet BB aviation units until transferring to the Pacific Theater in late 1944.



Circa Aug 1944 Atlantic Ocean. USS Missouri BB63 recovering a Vought O2SU Kingfisher aboard on the ship's shakedown cruise. Note the handling crane, lifting rig, MkVI catapult and camouflage pattern carried across the deck. The O2SU was the standard WWII USN floatplane of WWII. The O2SU design offered more flexibility as a utility type aircraft than the single set fighter type successor SC1 design.



Circa 1945 Curtiss SC1 Seahawk was the last floatplane designed for the USN. The SC1 featured improved performance, folding wings and began displacing the O2SU's in late 1944. The SC1 was not as popular as the O2SU due to the single seat design which did not allow for the rescue of downed air crewmen. CB1 was the 1st to deploy SC1 in 1944. BB63 was the last to deploy the SC1 in 1949.

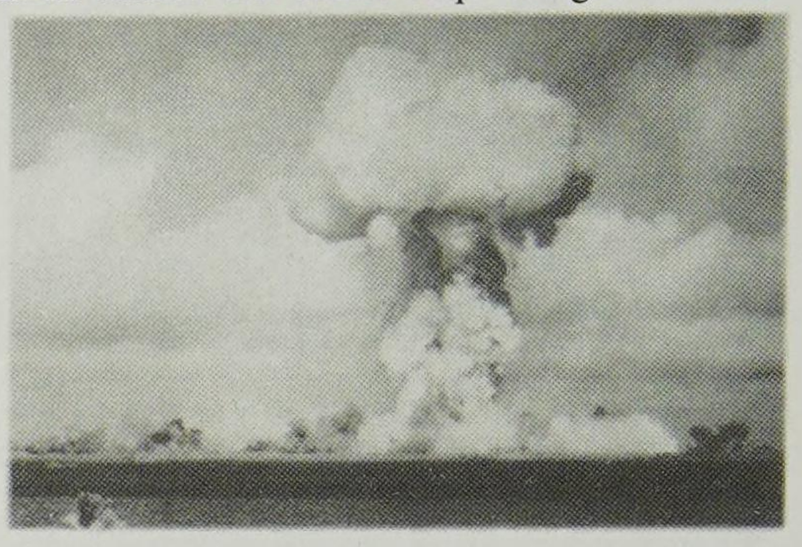
Circa Jul 1948 Sikorsky. HO3S1 Dragonfly. USS Missouri BB63. Landings by helicopter were made over the No 1 main turret until 1949 as the stern catapults restricted fantail landings. Most transfers at this time were made from a hovering position. After removal of the catapults in 1950 helicopter landings were usually made on the fantail.

Circ 1952 Piasecki HUP2 Retriever. A single engine, twin rotor design. Operationally used aboard the BB61 class 1951-1958. The HUP series of helicopters were the first in the USN equipped for Anti Submarine Warfare ASW, and the first to be fitted 'Dunking Sonar' which was a sonar on a retractable cable dipped into the water from a hover position to detect and track submarines.

Circa 1954 USMC Sikorsky S55 Whirlwind operating with a CVE105 class Escort Carrier. The USMC used the S55 as a troop carrier for vertical envelopment assaults from Amphibious Assault Ships (LPH's/CVHA's converted CV's and CVE's). The US Army's nearly identical H19 Choctaw's were used primarily for Utility, MedEvac and Transport functions. The USAF used the H19 as a dedicated Rescue helicopter assigned to Air/Sea Search and Rescue Squadrons (SARS).

Battleship Participation in Operation Crossroads July 1946

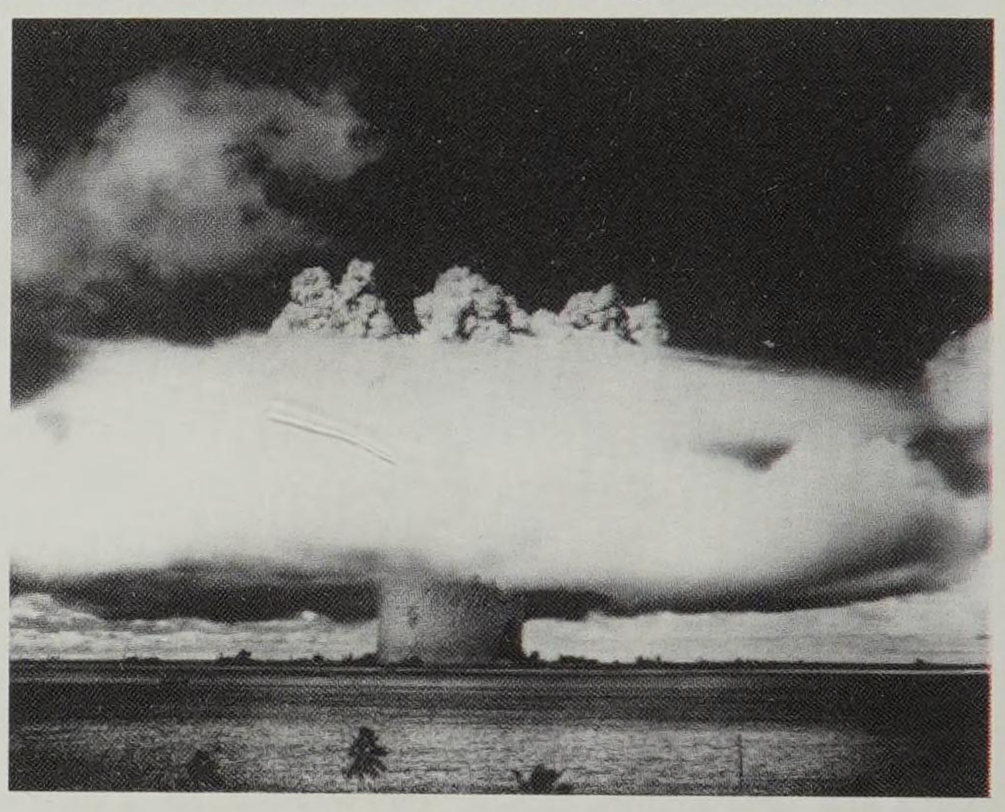
In Aug 1945 the destruction of the Japanese cities of Hiroshima and Nagasaki introduced a new era of Atomic Warfare. The advent of Long Range Strategic Bombers (B29) armed with Atomic Weapons, led many Government and Military leaders to declare the world's navies obsolete, and to predict their imminent demise. In keeping with this new "Atomic Philosophy" the USN was forced to commence a massive demobilization program due to significant reductions of funding levels. The USN immediately needed to obtain facts pertaining to the effects of Atomic Weapons on warship designs. And to incorporate the data acquired into required modifications on current and future ships designs to resist Atomic effects. Effects comprised of Blast Overpressure, Thermal Pulse, and Ionizing Radiation (Initial and Residual). Resultantly, a series of 3 Atomic Tests (1 air and 2 subsurface bursts) code named 'Operation Crossroads' were scheduled to be held at remote Bikini Atoll in the Marshall Islands. In Jul 1946 a target array of 97 ships, including the BB33 BB34 BB36 BB38 and the Japanese BB Nagato were assembled for the tests. All BB's survived airburst Test Able. During subsurface Test Baker BB33 sank, Nagato capsized and sank as a result of damage on 4 Aug 1945. A 2nd subsurface burst (Test Charlie) was canceled. The surviving BB's were all were heavily contaminated with radioactive water and particulates from Test Baker. The ships were extensively evaluated (BB34 at Pearl Harbor, BB34 BB36 BB38 at Kwajalein). The surviving BB's were subsequently sunk as targets (BB34 BB36), or scuttled (BB38). Prior to the tests the states of NY and PA requested the USN assigned the BB34 and BB38 as museum ships, the requests were ultimately denied, and the ships were to heavily contaminated to release for use afterwards.

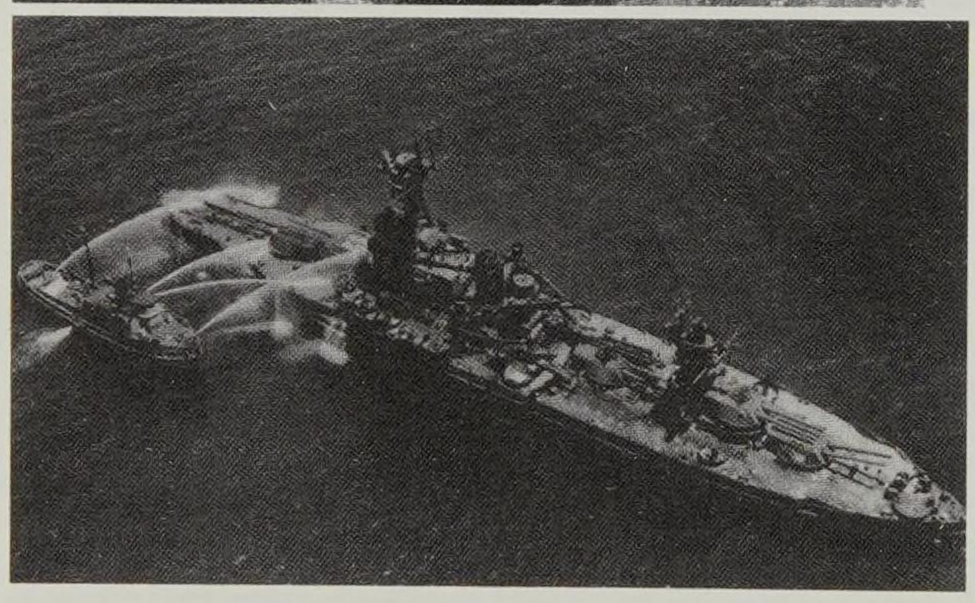


Above: 1 Jul 1946 Test Able 21kt at 520' altitude 400yds from BB36.

Left: 12 Jul 1946 Bikini Atoll. Target ship array after Airburst Test Able. BB36 center BB34 left CVL22 at the bottom. Note the oil leak trails indicating hull damage.

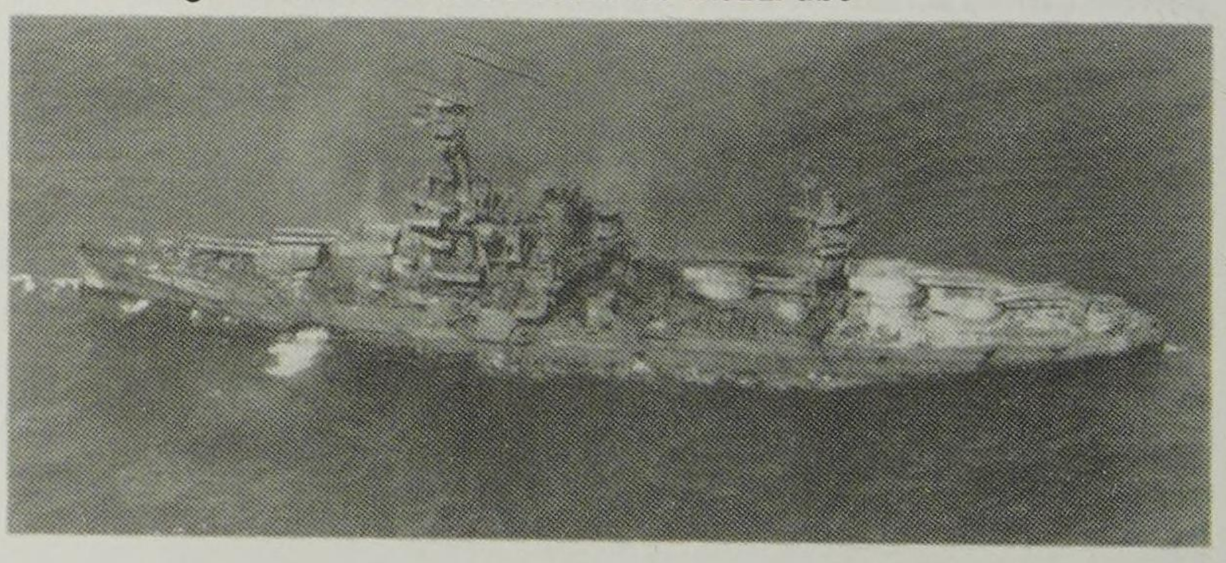
Right: 25 July 1945 Test Baker 21kt 90' under water suspended below the LSM60. The dark shape on the right bottom side of the water column is BB33. The top of the actual blast cloud can be seen emerging above the transient water condensation ring

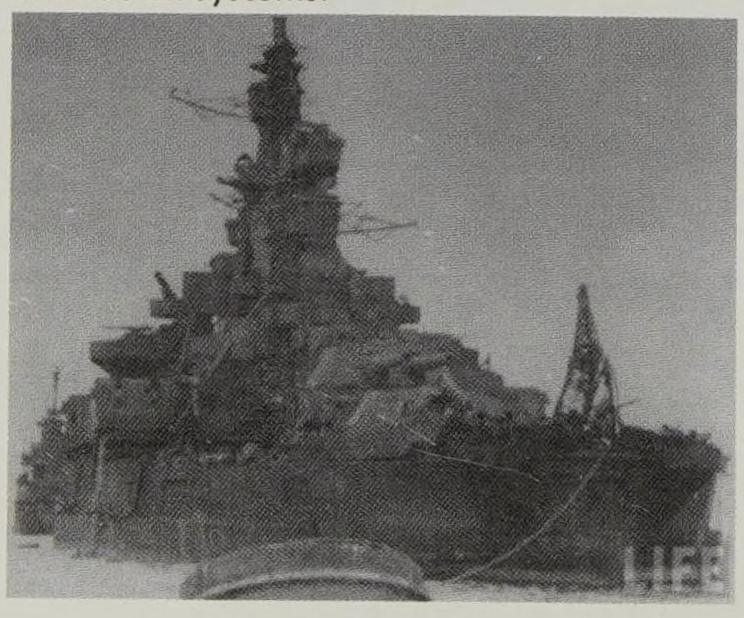




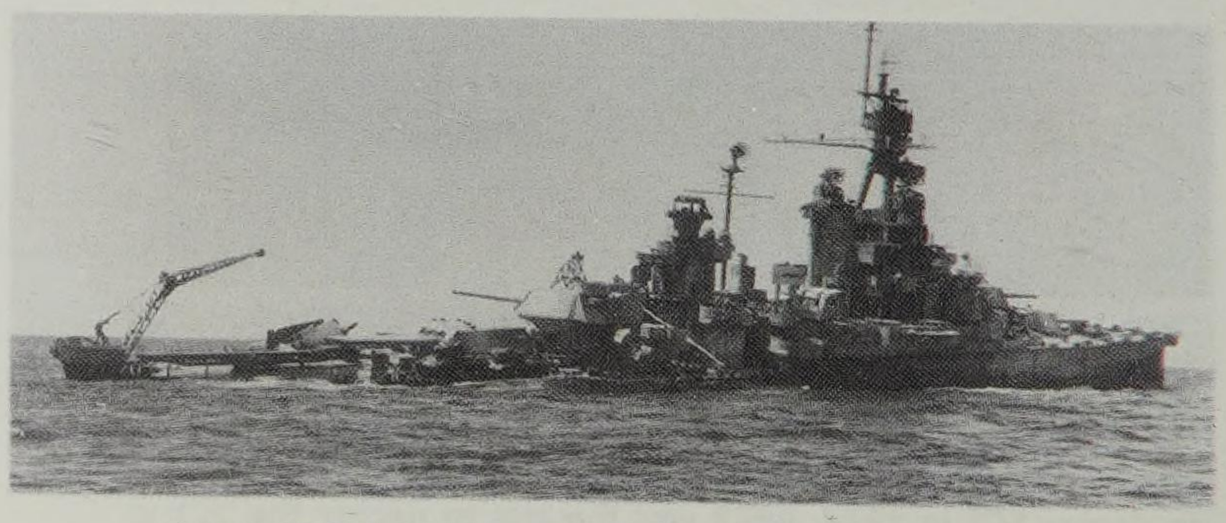
Above: Decontamination of BB34 with high pressure fire hoses. Data obtained from Operation Crossroads led to the USN's ABC (Atomic Biological Chemical) decontamination programs and washdown systems.

Below: 25 Jul 1948 SW of Oahu Hawaii. BB34 being sunk as a target. Note the hull damage forward. Paint is a scorched Ms21. dbc





Left: BB36 blast damage from Test Able. The tests proved conclusively that BB types, due to their heavy construction, were better able to survive Atomic Weapons than other ship types. Life Photo via USN



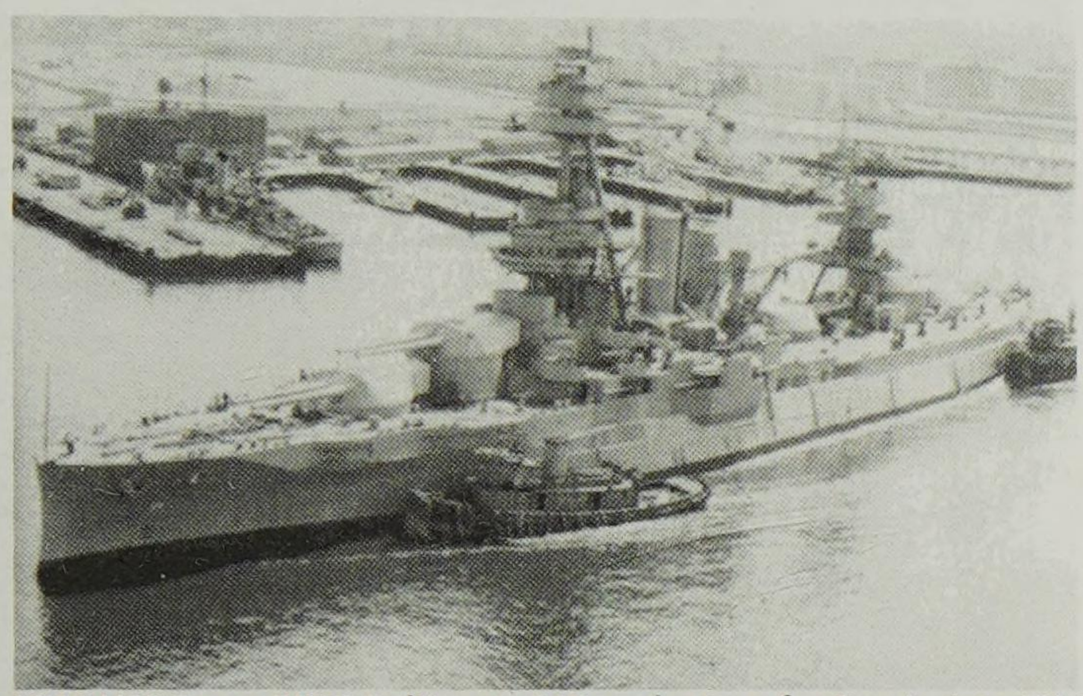
Above: 10 Feb 1948 scuttling BB38 off Kwajalein.

USN Battleship Reserve Program 1946-1963

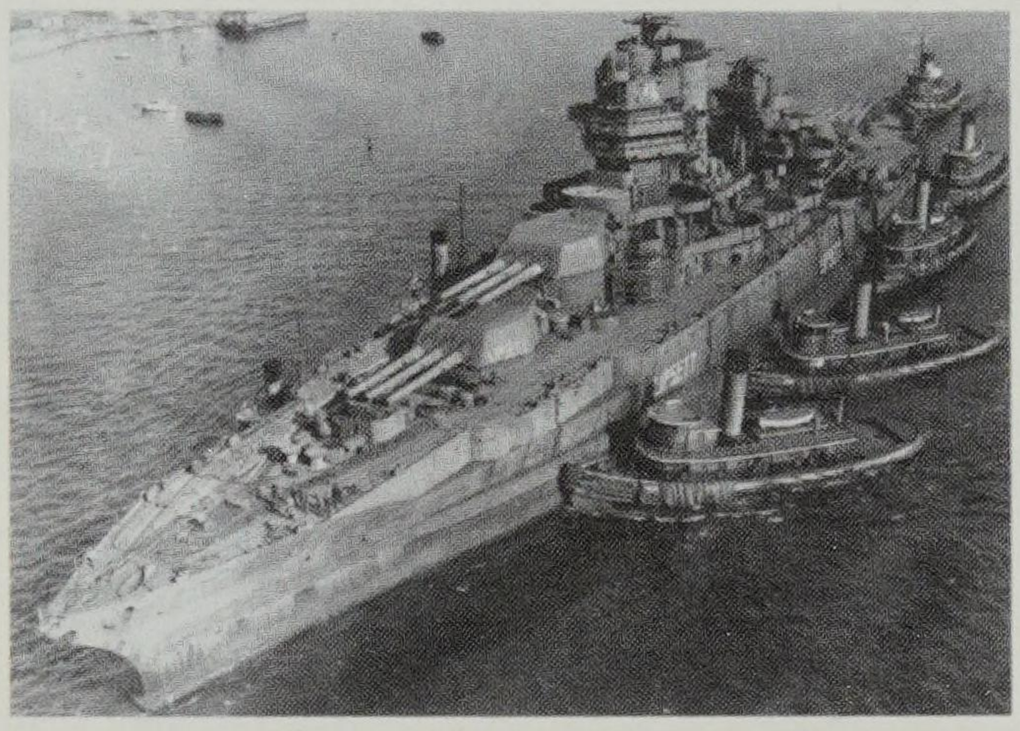
The USN maintained 6 Reserve Groups that stored BB/CB types 1946-1963. Puget Sound NSY, Hunters Point NSY, Norfolk NSY, Philadelphia NSY, Boston NSY, and the Bayonne Annex. The BB's were maintained as mobilization assets ready to be reactivated until stricken. All BB's were in reserve during 1946-1963, with the exception of the 4 BB61 class ships which served postwar. The BB61 class ships were active from the Korean War until Dec 1958. The BB43 BB45 BB55 BB57 BB61 CB1 class ships were carefully preserved at the end of WWII and ready for recall as demonstrated by the reactivacations of the BB61 class ships in 1950/51 for Korea and later in the 1980's.

During preservation for decommissioning all sensitive equipment was removed and stored under onboard sheds or below decks, the ships were then sealed, and temperature control dehumidifiers were provided to retard internal deterioration. The hulls were wrapped with electric cables and a current pass thru to inhibit marine growth and prevent deterioration of the steel plates (Cathotic System). The USN had 4 maintenance categories for reserve ships: Able, Baker, Charlie, and Dog. Ships in category A had maintenance personnel assigned, and they received regular dry dockings, paintings, and checks. Categories B and C were interim steps to Category D, which were ships, usually stricken from the NVR, that were awaiting disposal.

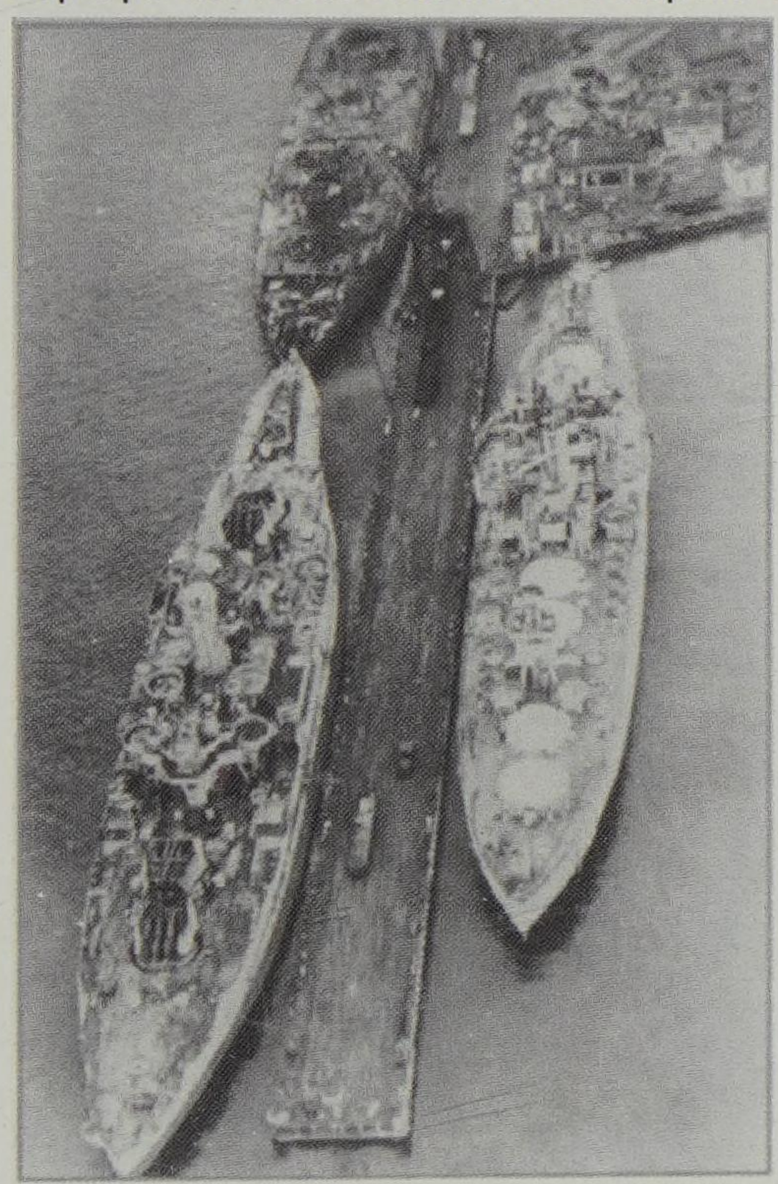
The 4 BB61 class ship were the only USN BB's to be reactivated. The other classes of BB's remained in reserve until disposed of. They were stricken from the NVR starting with the BB40 class in 1947, the BB43/BB45 classes in 1959 and the BB55/BB57/CB1 classes in 1961/62. Considerations were made to dispose of the BB61 class in 1963, but they were retained until the late 1990's.



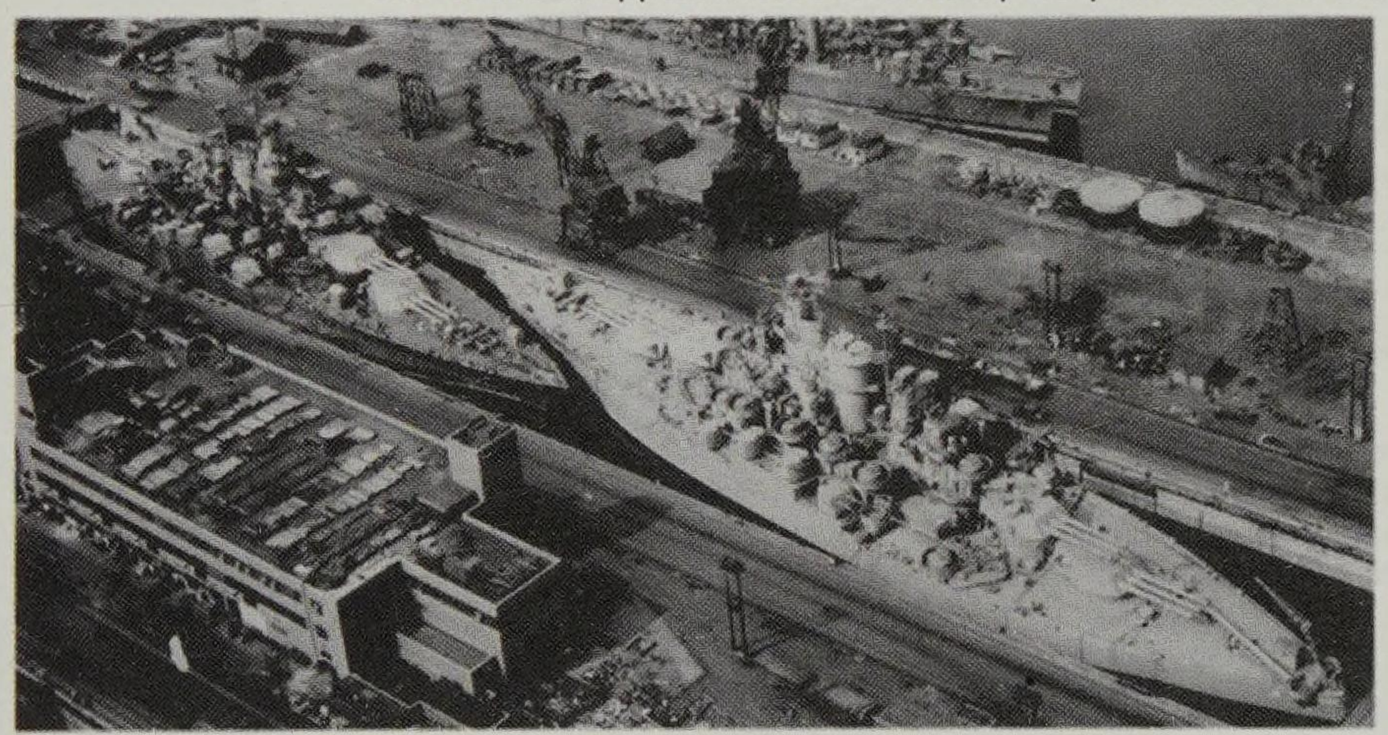
Apr 1948 USS Texas BB35 Baltimore MD under tow for San Jacinto TX. The Ship is painted Ms 13. Note the Mk 3 atop the foremast.



Nov 1947 USS New Mexico BB40 Boston NSY under tow to Newark note all armament has been removed prior to the ship being handed over to the scrappers. Note the name Lipsett painted on the hull.

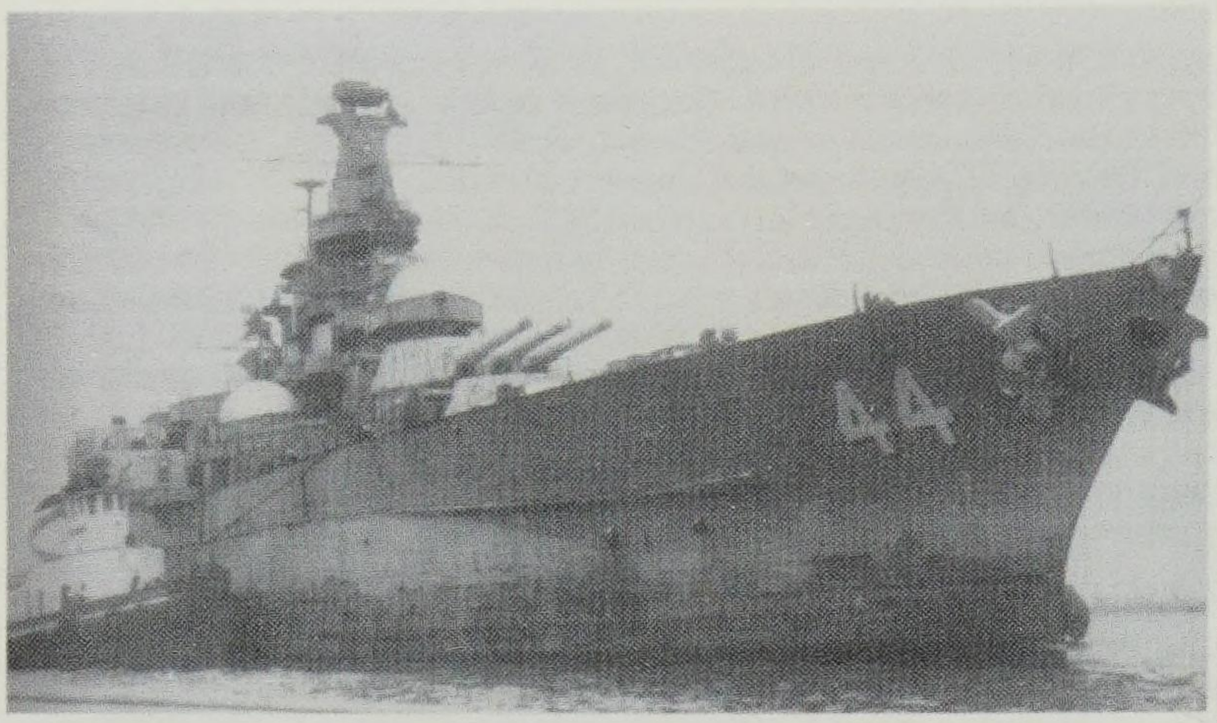


Above: Jan 1948 Lipsett Shipyard Newark. USS New Mexico (bottom) USS Wyoming AG17 (right) USS Idaho BB42 (upper) in process of being scrapped. BB40 BB42 were held in reserve less than 1 year before being stricken and scrapped.

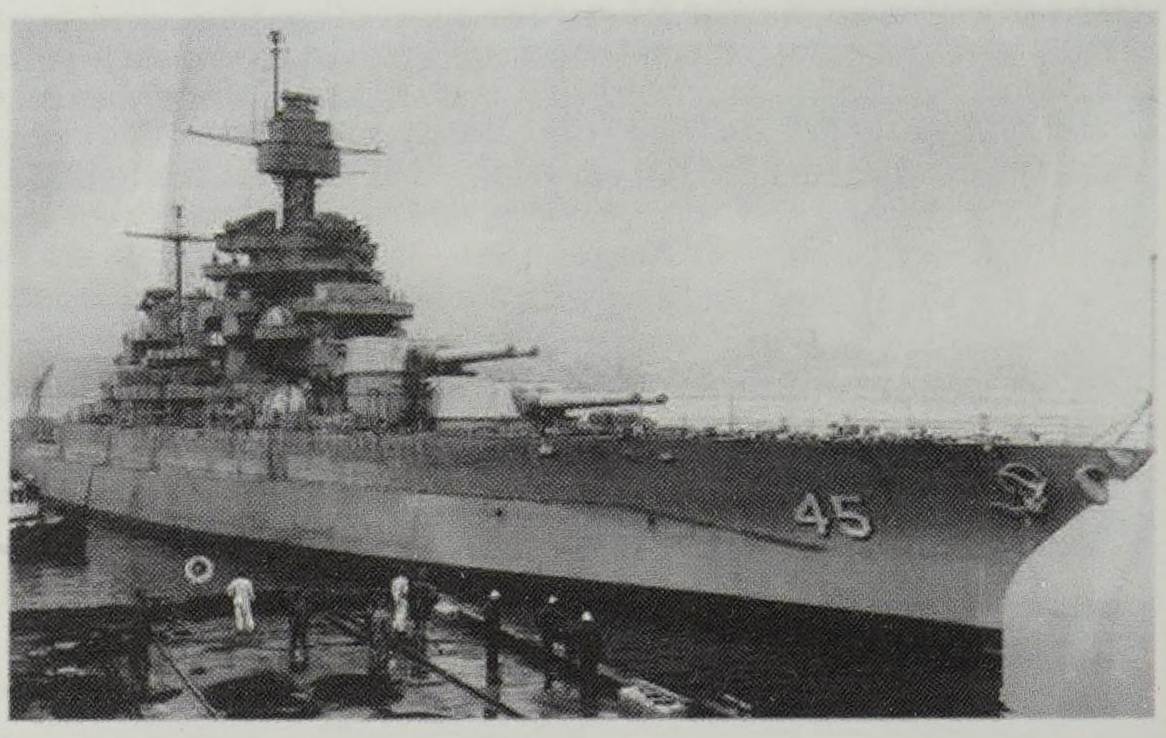


Above: Circa Oct 1946. BB44 right, and BB43 left, undergoing preservation for inactive duty, note BB44's 40mm have received canvas covers but are not yet cover by cocoons. Note BB44's deck has been painted Haze Gray. BB43 and BB44 were stored together in drydock 5 at PhNSY from 8 May 1946 until removed for scrapping in late 1959.

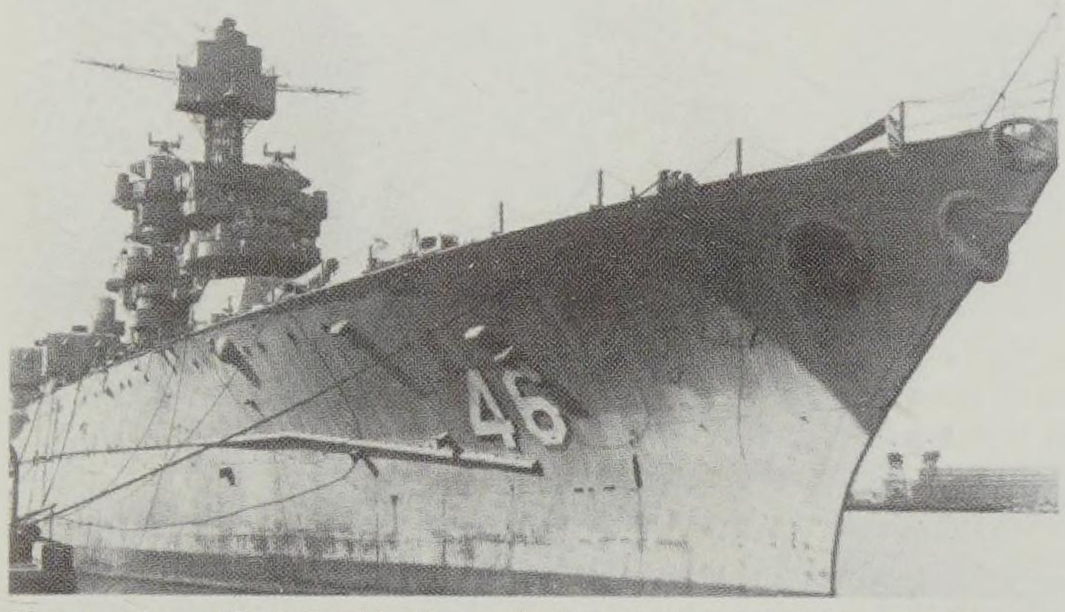
Right: Aug 1959 Bethlehem Steel Baltimore MD USS Tennessee awaits scrapping. BB44 is across the pier to the left. When a USN ship is scrapped all Government Furnished Equipment (GFE) (armament, furnishings, galley equipment, machinery) is returned to the USN to be recycled into new construction ships.



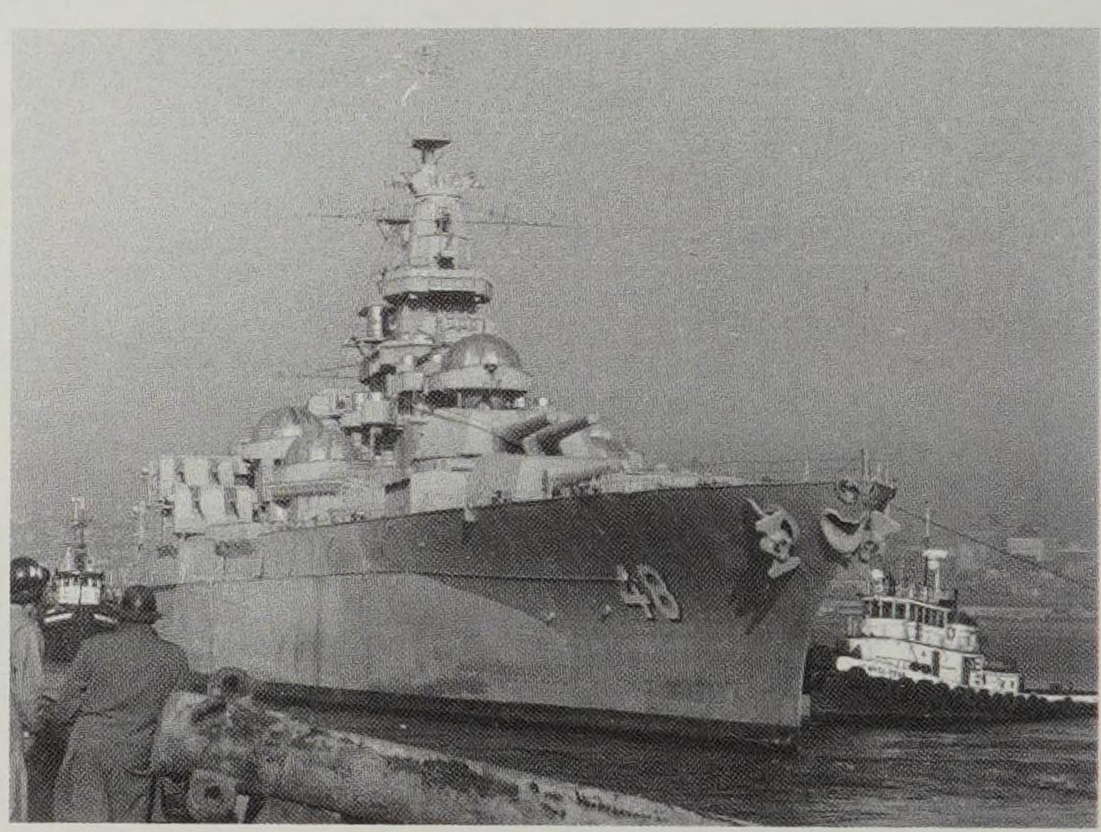
Left: Jul 1959 Philadelphia NSY USS California BB44 under tow to Bethlehem Baltimore for scrapping. BB44 and BB43 operated together from 1944 onwards and they were stored in reserve together. They would also be scrapped across the pier from one another.



Right: Aug 1959 Todd Tacoma Shipyard WA. USS Colorado arrives for scrapping. Note the large hull numbers which all reserve BB's received in the early 1950's. Which BB43-BB60 never carried in active service.

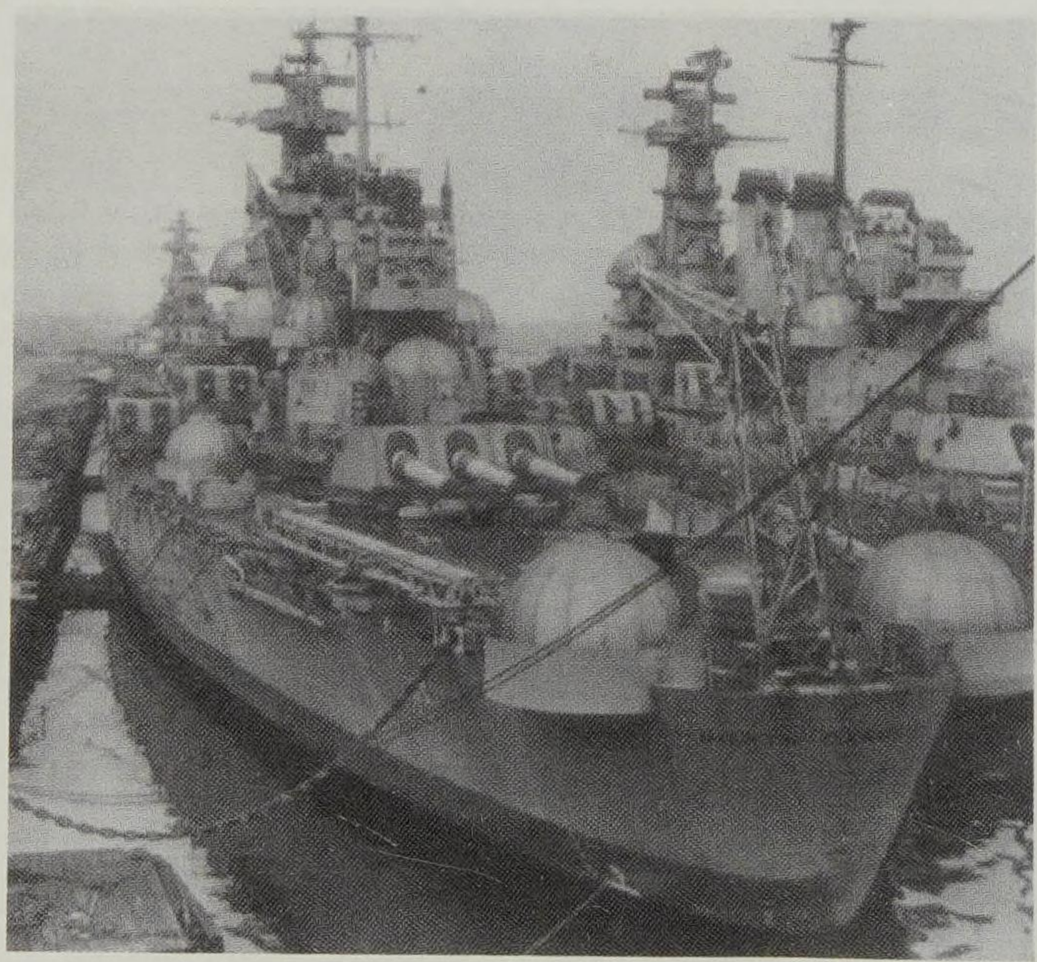


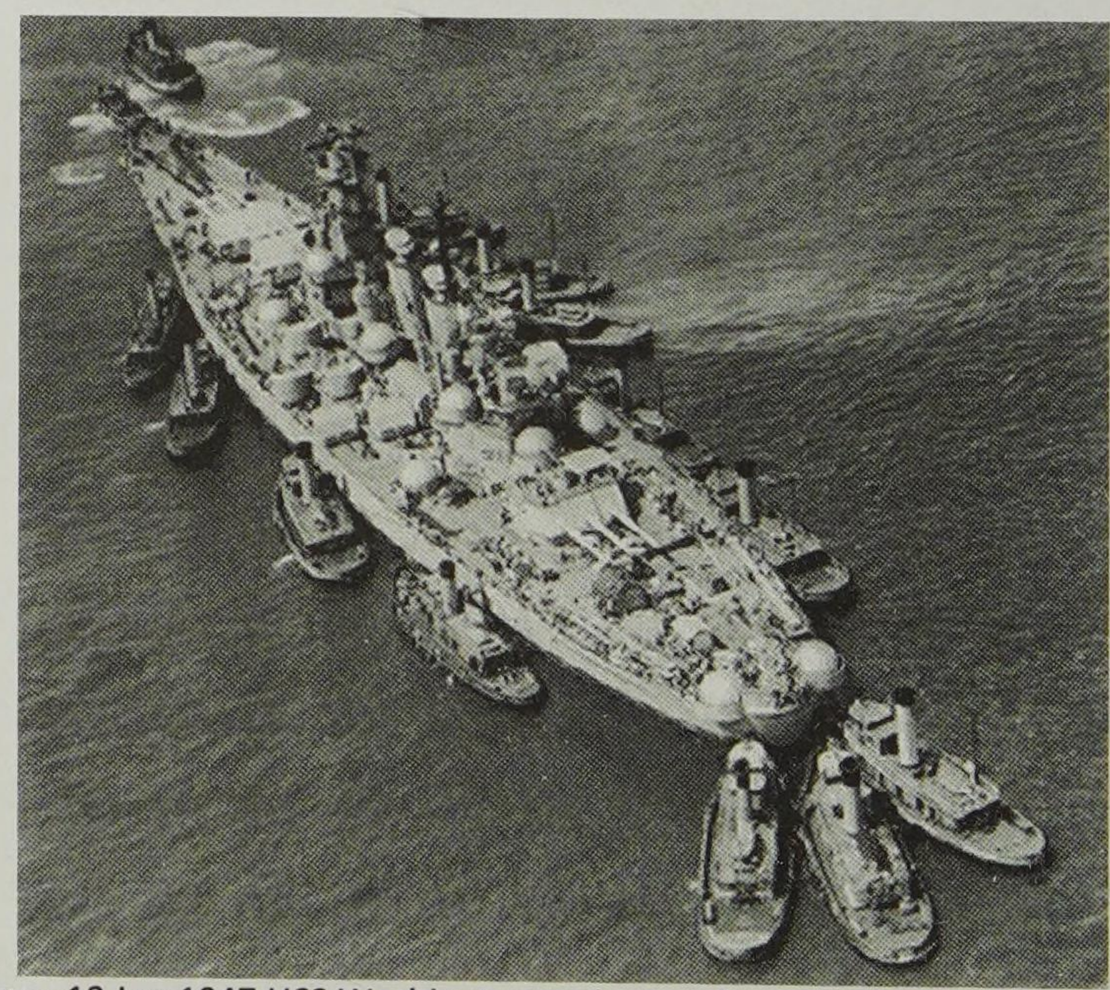
Above: Aug 1959 Todd Alameda CA. USS Maryland awaits scrapping. Note the external AVGAS pipe running from a forward peak tank to the aircraft handling area on the fantail.



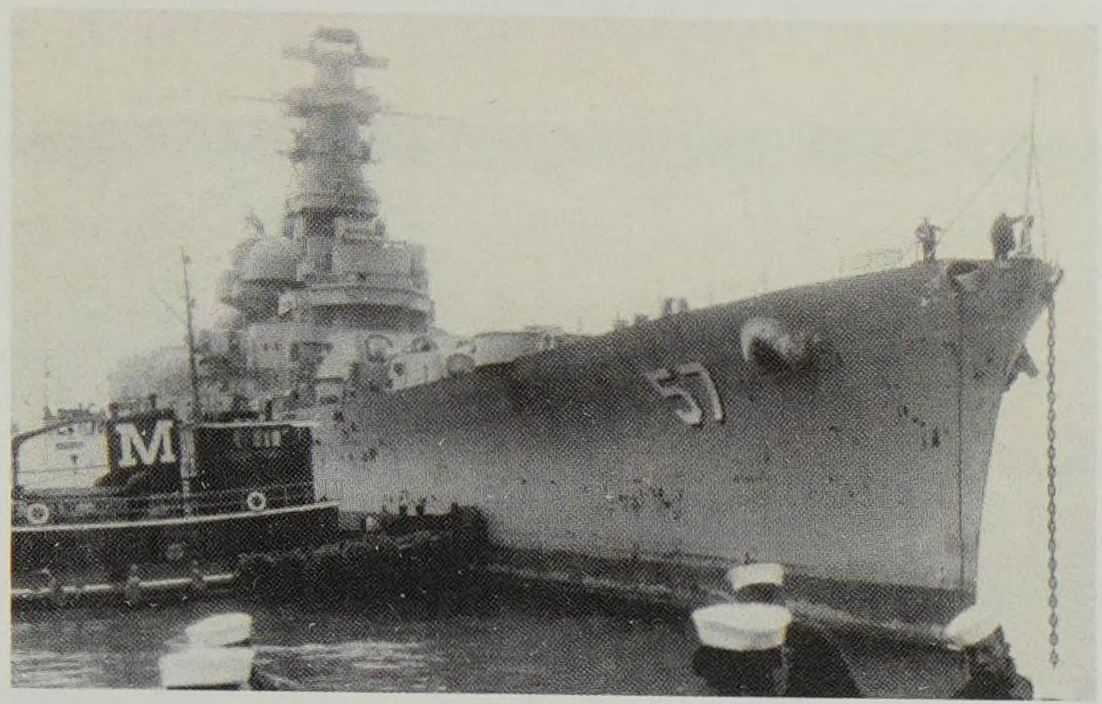
Above: 1 Mar 1959 Puget Sound NSY USS West Virginia departing for scrapping at Union Metals Oakland CA.

Left: 25 Feb 1951 USS North Carolina (L) and USS Washington (R) at the Bayonne Naval Annex note the retention of the catapults and black painted stack caps.

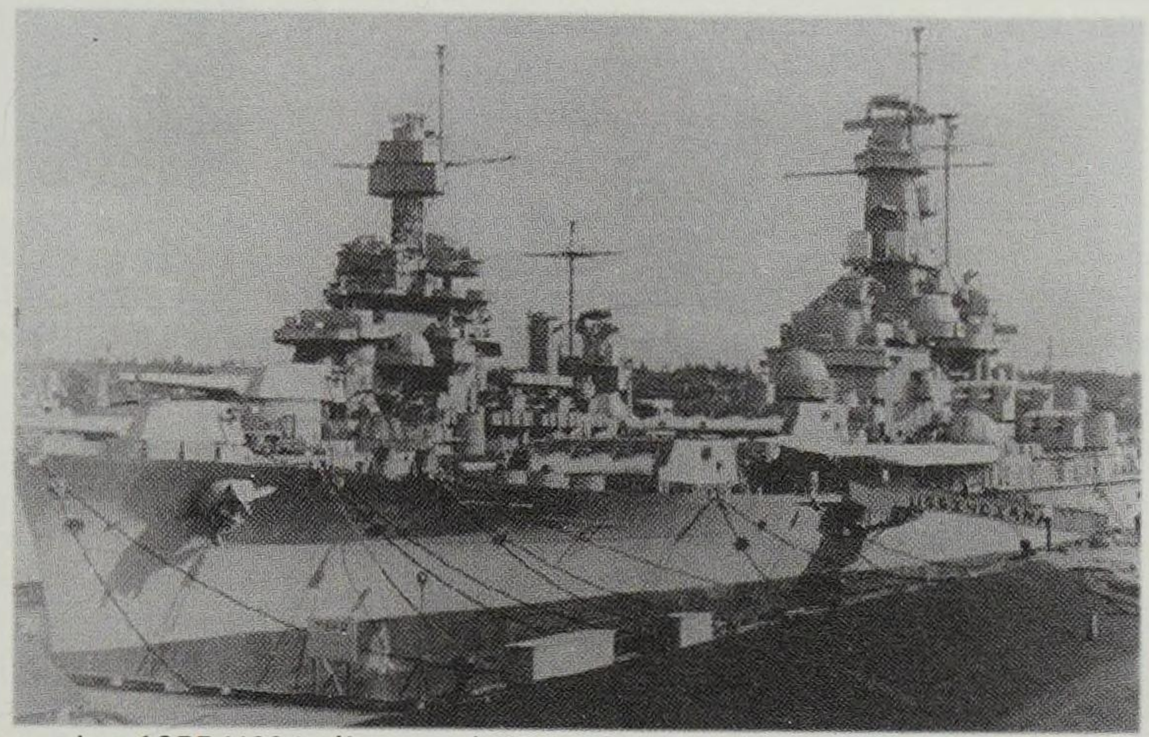




Above: 19 Jun 1947 USS Washington under tow from the New York NSY to storage at Bayonne Annex. Note the 11 tugs in use BB were usually moved with 3-4 tugs. BB56 status is 'in reserve in commission'.

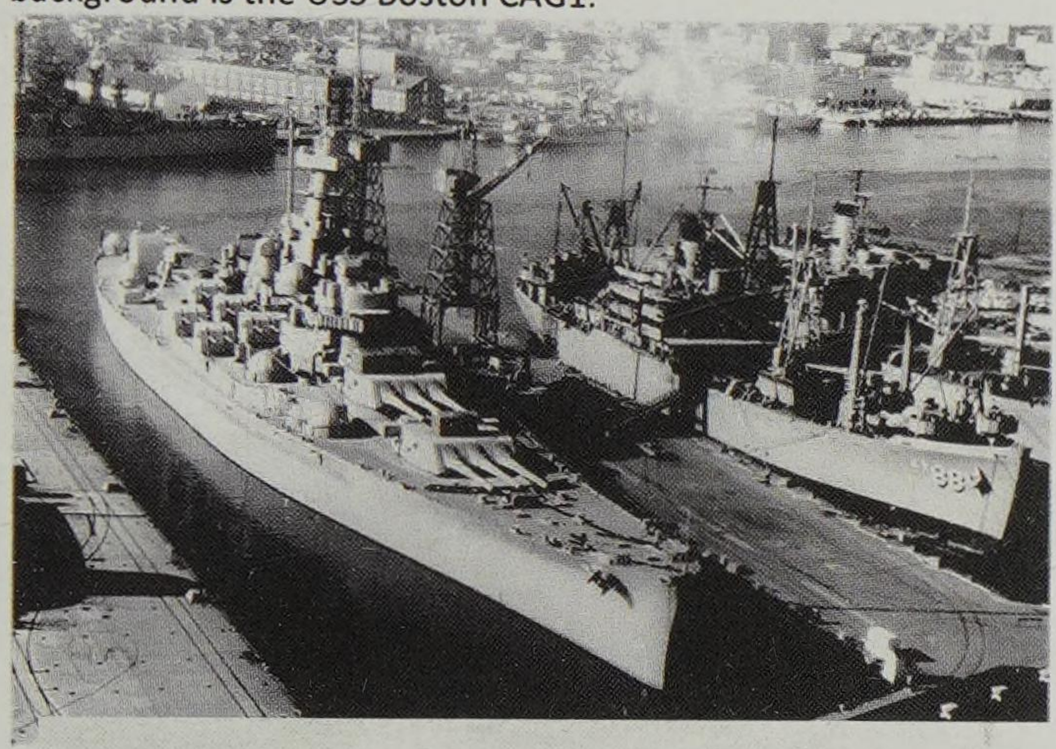


Left: Oct 1962 Philadelphia NSY. USS South Dakota BB57 under tow to Lipsett Co. Newark ,NJ for scrapping. Note the large hull number and the Morgan Towing Co. tug. The firecontrol radars were left in place when BB57 was decommissioned in 1947. Paint is Ms13.

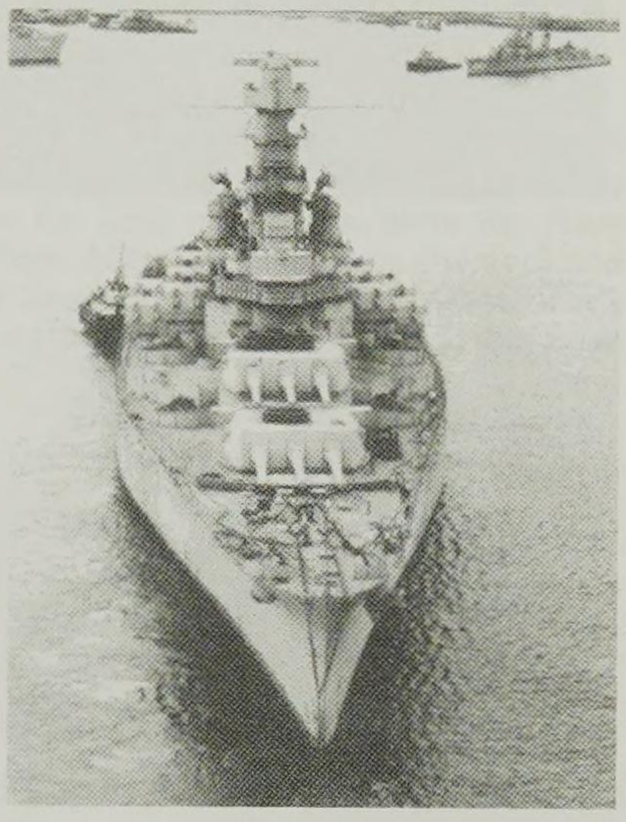


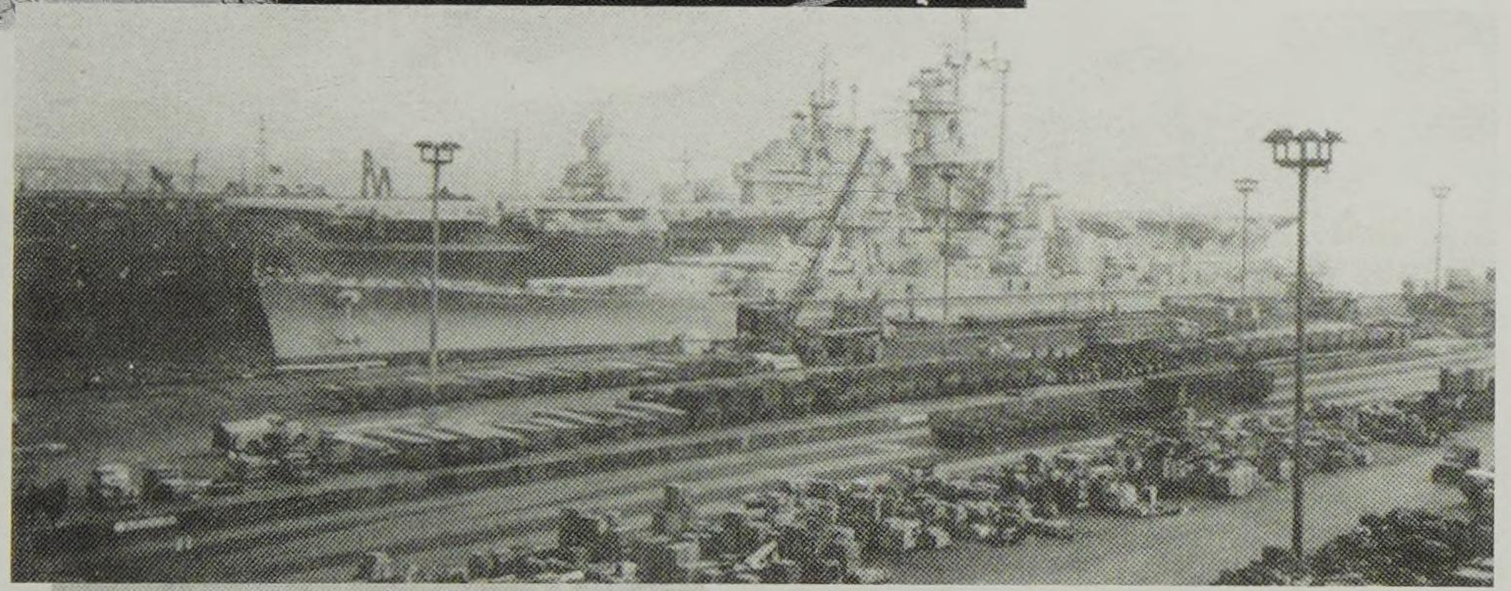
Above: Jun 1955 USS Indiana and USS Colorado (L) at Puget Sound NSY. Note the large number of lines securing the ship to the pier, and the awning on the quarterdeck.

Below: Jan 1963 Norfolk NSY VA. BB59 awaits transfer to the ship's permanent berth at Fall River MA. The States of TX, NC, MA, and AL all had the foresight to save their namesake ships and preserve them for future generations to understand what a "Battleship" was. Across the pier is the USS Uvalde AKA88 and another AKA. In the background is the USS Boston CAG1.

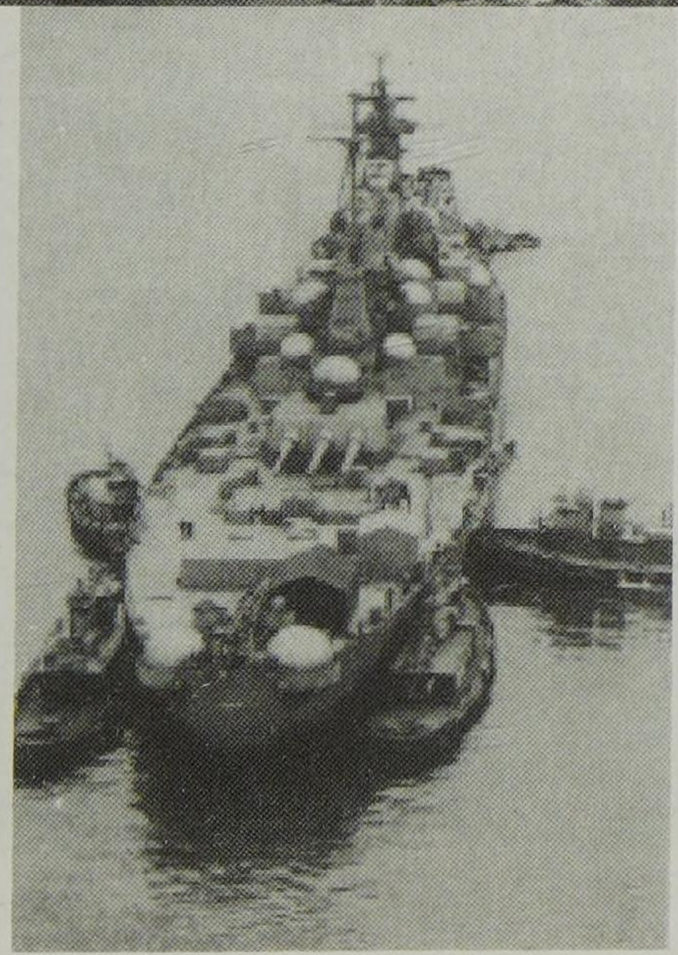


Right: July 1965 Norfolk NSY. USS Massachusetts under tow to Fall River MA to be permanently moored as museum ship.





Left: Sep 1946 Puget Sound NSY USS Alabama BB60 being moved into storage, in the background is the USS Bunker Hill CV17 and USS Maryland BB46. BB60 became a memorial ship in 1964 at Mobil AL.

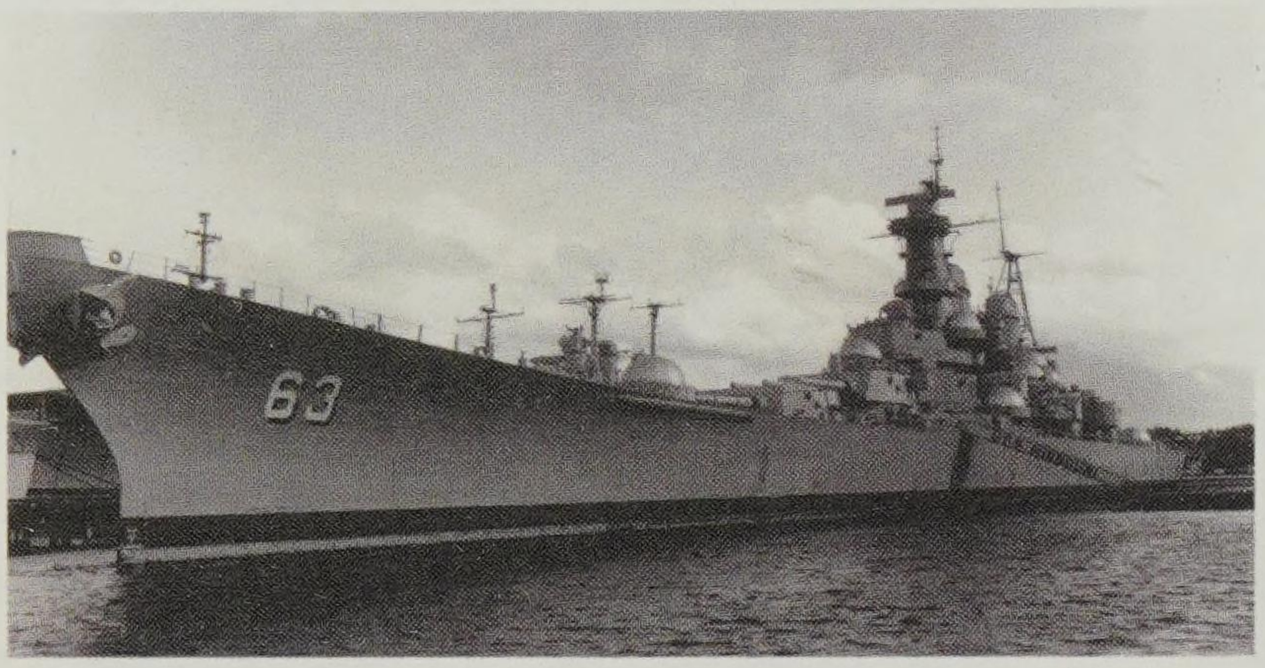


Left: Mar 1949 USS Iowa being moved to storage at Hunters Point NSY CA. BB61 recomissioned for Korea then went back to reserve in 1958. Note the catapults have been removed. BB62 and BB64 retained their catapults until Korean War reactivacations.

Above: 29 June 1948 USS New Jersey under tow in NY Harbor enroute to storage at Bayonne Annex in NJ. Note the NYC skyline in background.

Right: 11 Aug 1962 off Bayonne NJ. BB62 in reserve and under tow to Philadelphia NSY from Bayonne NJ. Note the lattice mainmast without the kingposts. The center 40mm of the amidships triple 40mm array is empty as an Mk56 director had replaced it in 1955.

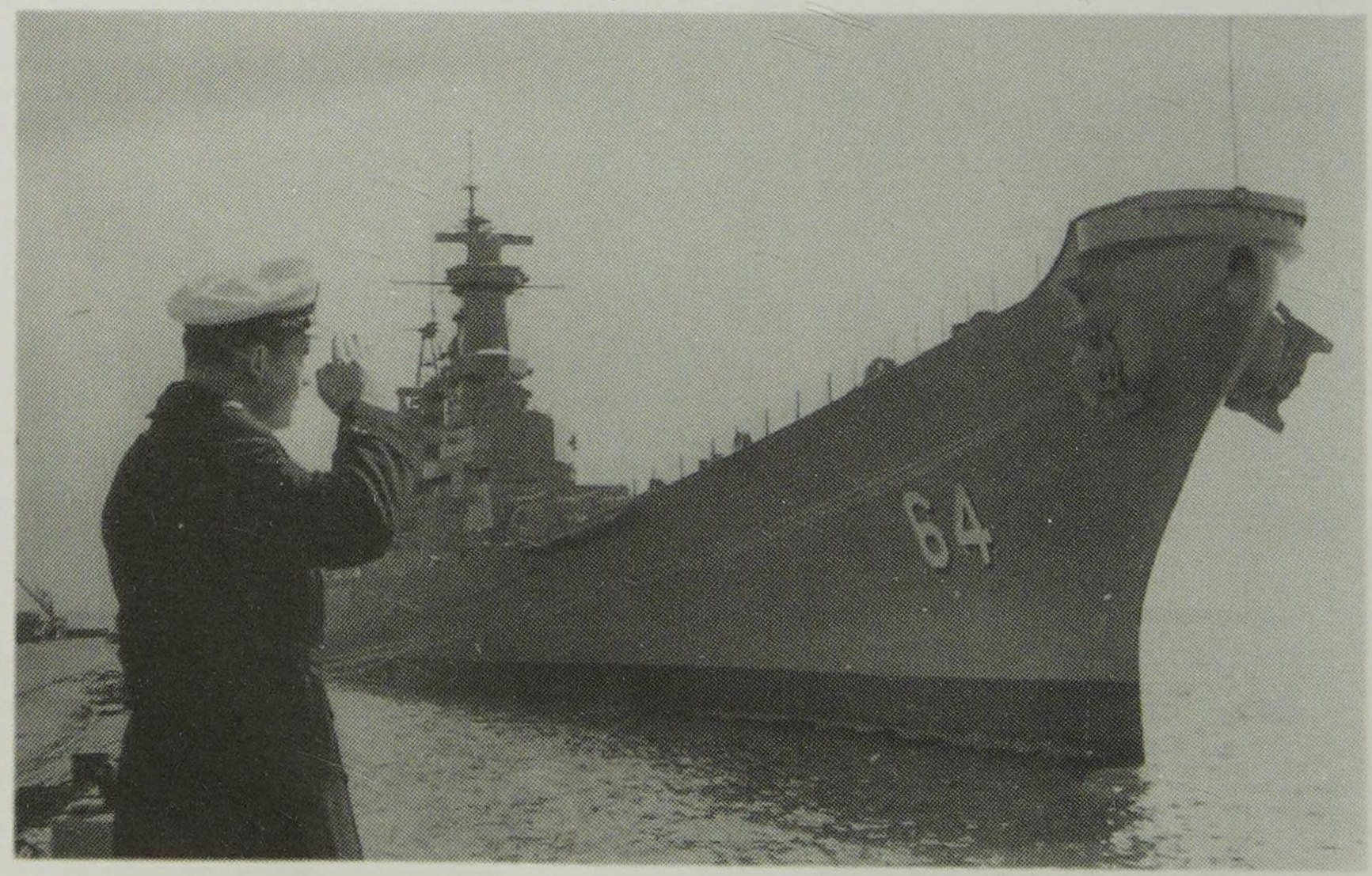
Below: 4 Jul 1963 Puget Sound NSY. BB63 in reserve. Only BB63 was in reserve on the West Coast from 1955, until 1969 when joined by BB62 which had been decommissioned after a single VietNam deployment. During this period and until BB63's 1980's reactivacation, the foredeck and the "surrender deck" were open to visitors. BB63 was major tourist destination in Bremerton 1955-1985.

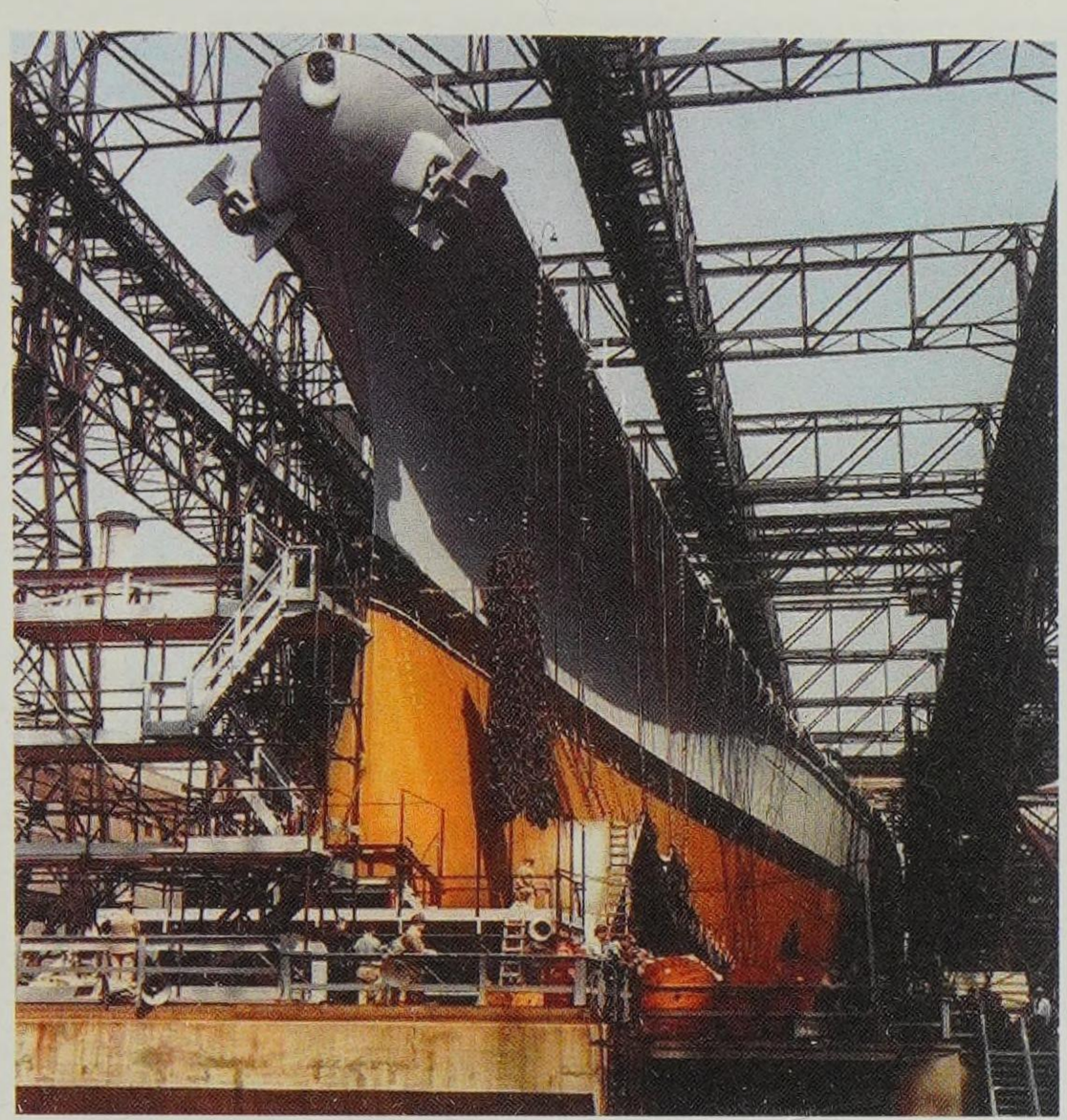


Below: 17 Aug 1962 New York Harbor. BB64 under tow from the Bayonne NJ Annex of the New York NSY. The ship is enroute to the join BB61 and BB62 at the Inactive Ship Facility at the Philadelphia NSY where BB64 and BB61 would remain until the 1980's. Note the kingpost on the mainmast. And that the ship is at light ship displacement and that the Ms13 paint had not been extended to the ship's light displacement waterline but remains at the normal displacement waterline, BB62 also had this configuration. At the time BB61 had Ms13 paint to their light displacement waterlines.

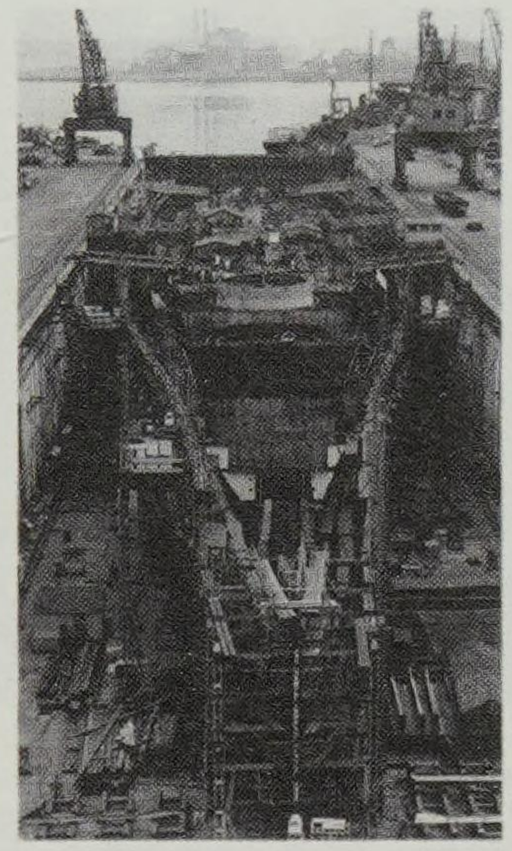
Above left: circa 1960 Bayonne Naval Annex NJ. Large Cruisers USS Guam CB2 (L) and USS Alaska CB1 (R) in the background is the USS North Carolina BB55 and the USS Enterprise CV6. BB56 BB62 and BB64 were also stored at Bayonne. BB56 was sold for scrap in 1961. Ships stored in category 'A' were maintained for a 30 day recall cycle to their last operational configuration.

Right: 8 Mar 1958 Bayonne Annex NJ. USS Wisconsin is placed out of commission leaving the USN without a Battleship Type in service for the first time since 1896. In 1958 the USN retained 17 Battleship types in reserve, by 1961 the number had been reduced to 4 (the BB61 class). The USN's methodical preservation procedures and reserve maintenance processes maintained the BB's in excellent material condition ready to be reactivated as required. The 4 BB61 class ships were subject to multiple recalls to active service. Their materiel readiness was always such that only minimal normal overhaul, reconditioning, and replacement of obsolete electronic and habitability systems were required. INP soundphoto





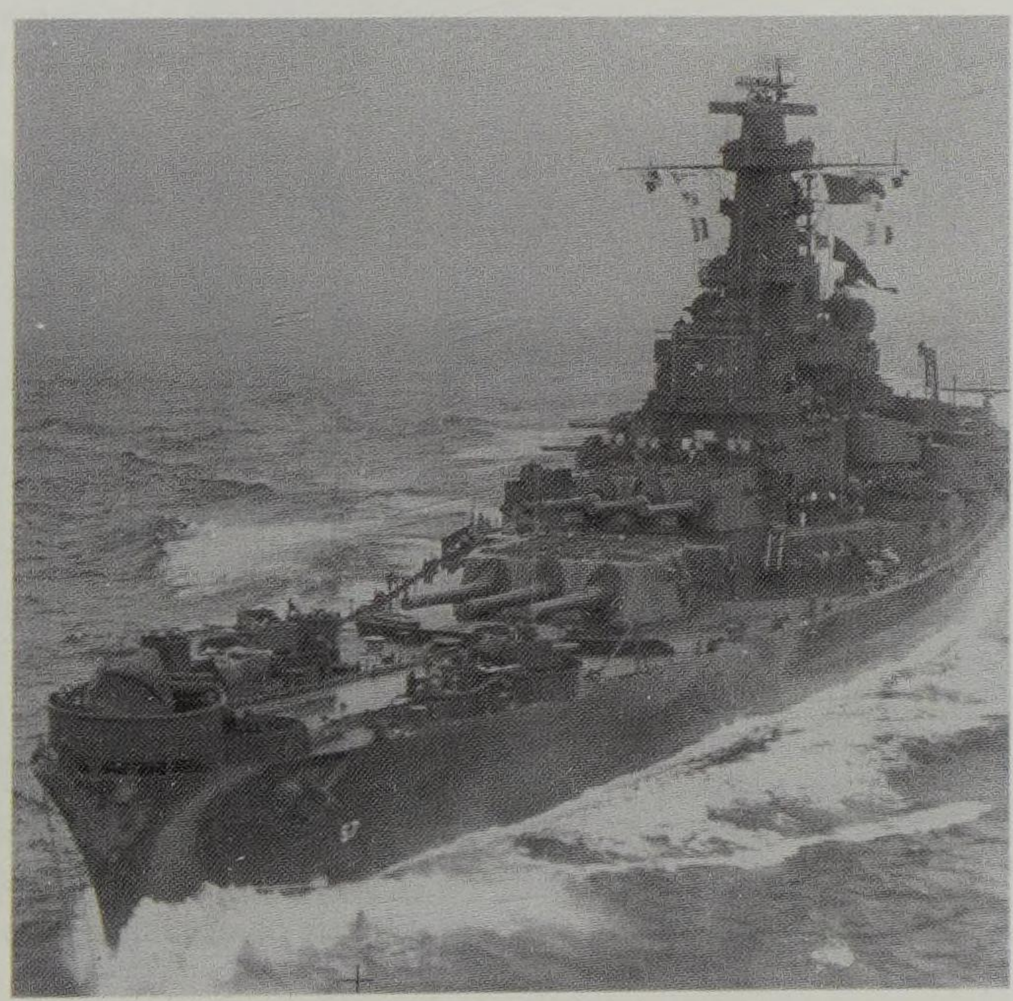
Left: 26 Aug 1942 New York NSY. The USS Iowa BB61 undergoing launching preparations set for 27 Aug 1942. The ship has taken slightly over 2 years since keel laying on 27 Jun 1940. A BB was approximately 60% completed when launched and required a further 8-10 months of fitting out. The hull and machinery are complete, but all armament and fire control remain to be installed.



Right: Mid 1946 Norfolk NSY USS Kentucky BB66 under construction. Note the transverse bulkheads and forward hull lines. Note the ship is under construction in a drydock vs. a building way. BB66 was the only US BB to be built in a drydock. The 5 ship BB67 class was also scheduled to be built in drydocks. Drydock construction placed much less strain on a ship's hull during launching operations.

Left: Circa Dec 1942 off East Coast. USS Alabama BB60 conducting main battery drills. A BB spent 3-4 months of shakedown and training prior to reaching IOC and becoming available for fleet operations. Note the Navy Blue of the Ms 12 (modified) camouflage. Also note the ice on the deck and turret tops. In icing weather it was necessary to chip ice off the ship's upperworks as to prevent the weight of the accumulated ice from destabilizing the ship.

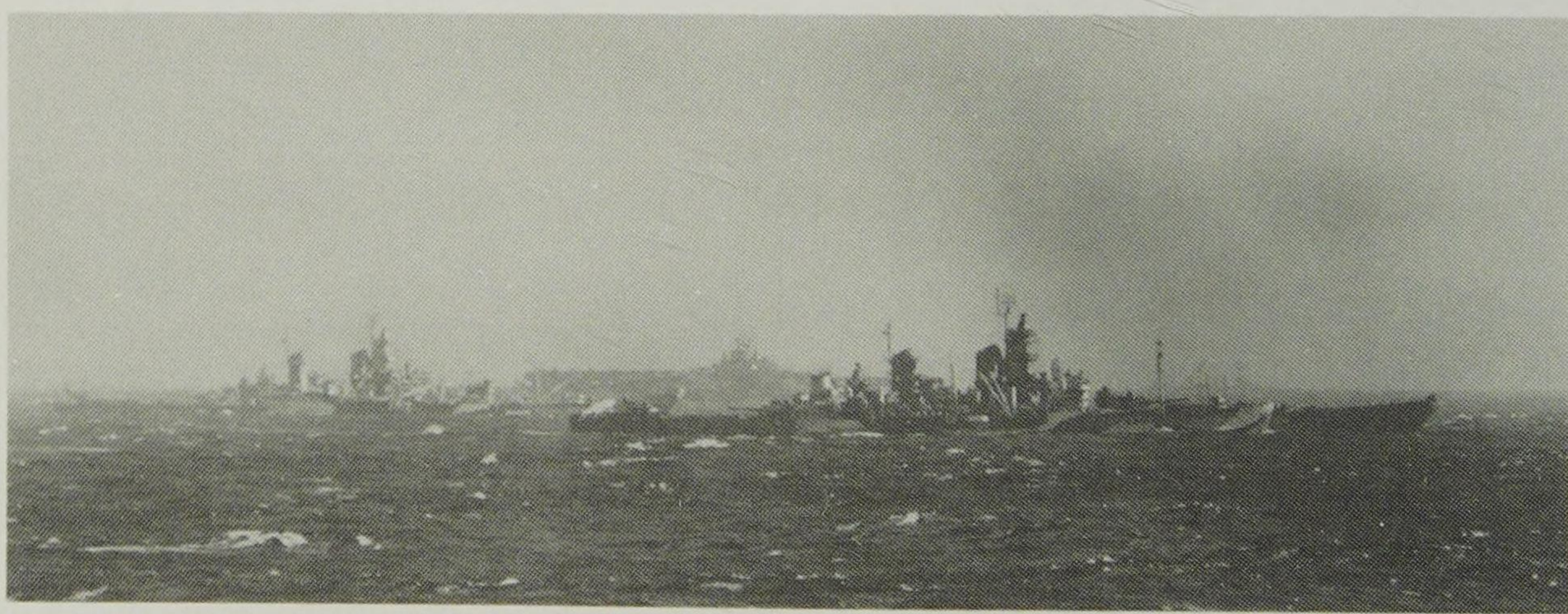
Above: Circa Jul 1944 off the NyNSY. BB63 underway at 15kns during the ship's shakedown period. Note the ship still carries the O2SU Kingfisher floatplane. The O2SU's were replaced with SC1's prior to BB63 deploying for the Pacific Theater. BB63 was the 1st and last BB to operate the SC1.



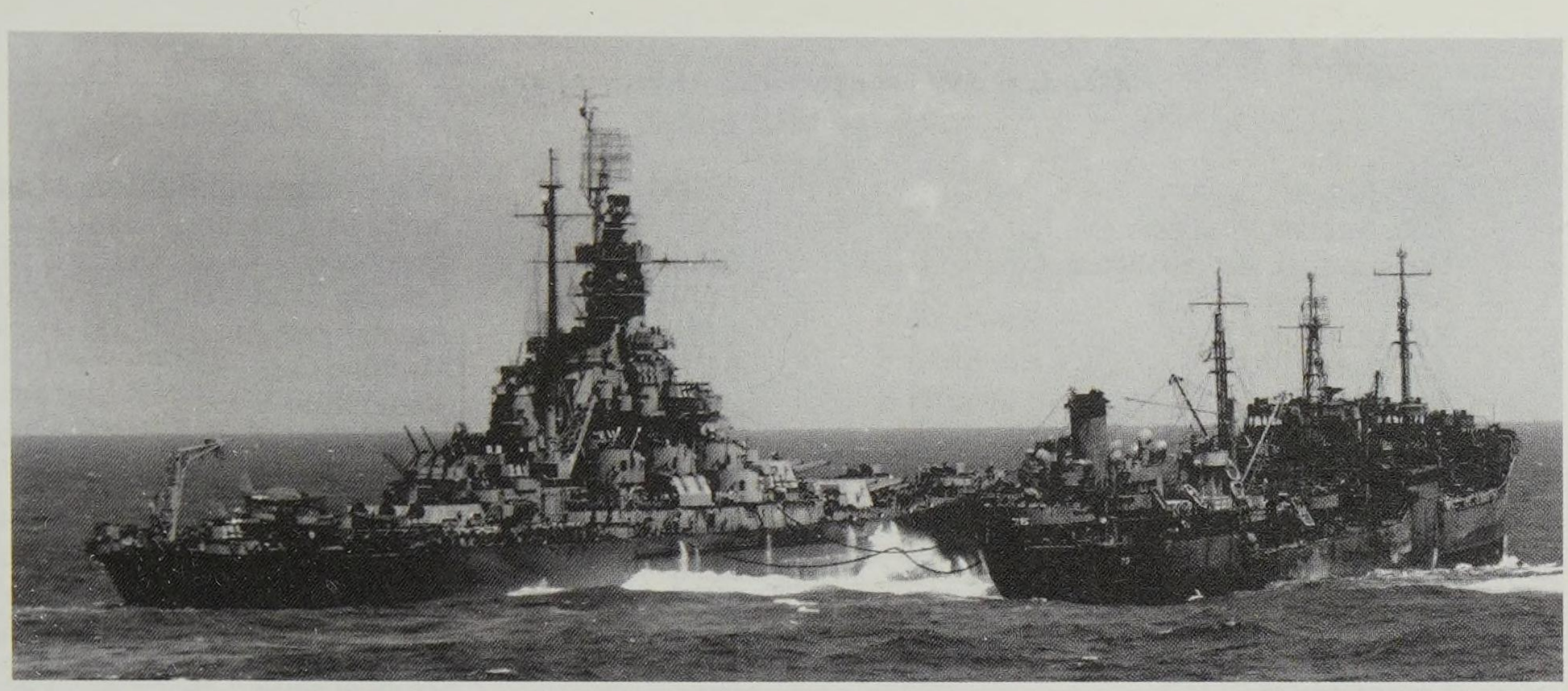
Left: circa Jun 1943 Atlantic Ocean. USS South Dakota BB57 enroute to deployment with UK's Homefleet. Note the bow 40mm mount, and the Mk3 mod0 radars atop the Mk38 directors. Signal flags, Semaphore, and Blinker (Adis) Lamps were extensively used for communication within a formation in order to maintain radio silence. Preventing enemy forces from locating the ship(s) via Radio Direction Finders (RDF) technology.

Ulithi Atoll Caroline Islands Mar 1945. USS Nevada BB36 assembles with the amphiboius landing forces prior to the Okinawa operations. Nevada, with BB33-BB35 served in the Atlantic tranferring to the Pacific in early 1945 for the final operations against Japan.

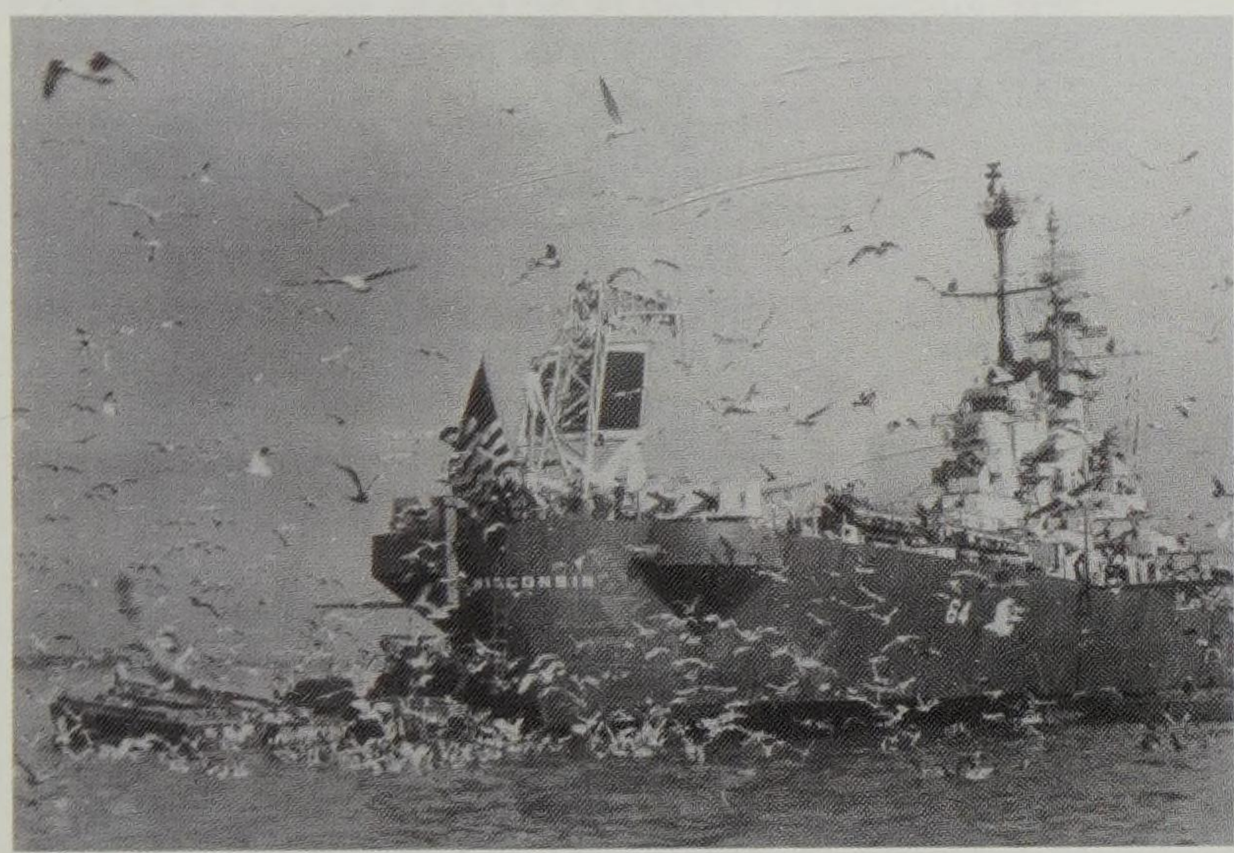
USS California BB44 Lingayen Gulf off Luzon Island Philippines 6 Jan 1945. Preparing to support Lingayen Gulf operations, BB44 was gliding into her assigned position for a morning fire support bombardment mission. When over the bow of an escorting destroyer streaked a bomb laden A6M5c Type Zero fighter. A barrage of fire from the ship's massive Anti Aircraft batteries fire erupted at the oncoming Kamikaze but to no avail. California was struck on the after main battery fire control tower. The kamikaze struck in a flaming inferno of exploding burning aviation gasoline and bomb detonations producing a massive fire ball that appeared to momentarily to engulf California. Within 12 minutes the raging fire had been brought under control and extinguished. California received temporary underway repairs and remained on her assigned duty station pounding Japanese positions until 29 January 1944, when she departed for Puget Sound for repairs and refit.



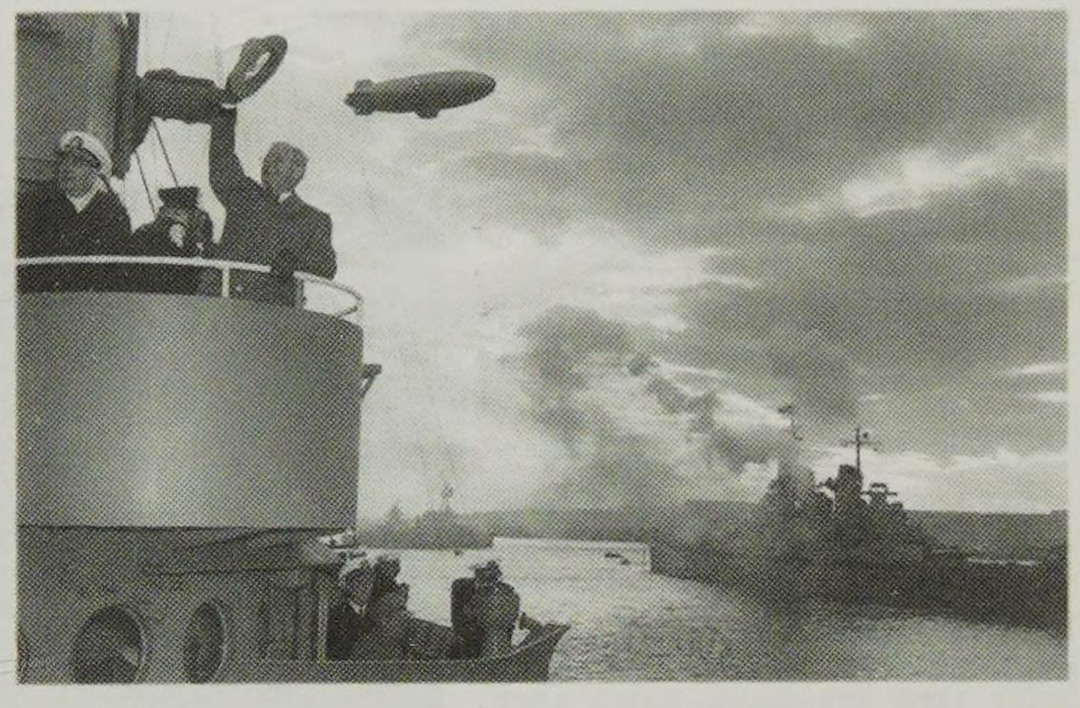
Above: circa early 1945 unknown location USS Missouri BB63 foreground and USS Wisconsin BB64 background refueling in moderate seas. The oilers and supply ships performed an endless shuttle of fuel and supplies from Hawaii and the West Coast to keep the fleet in the forward operations areas. No US operation during WWII was canceled due to supply issues. US logistics operations in WWII were outstanding. American industry was able to not only provide a surplus of supplies and equipment to US Forces. The US economy was also able to provide adequate fuel, equipment, and supplies to Allied Military Forces and National Economies enabling them to survive and assist the Allied Cause to achieve total victory over the Axis Nations.



20 Apr 1945 USS Massachusetts BB59 refueling from the fleet oiler USS Saugatuck AO27. Note the tall mainmast with an SC set fitted. Fueling from an AO was normally scheduled every 7 to 10 days. The BB's and CV's thus fueled would then in turn refuel their relatively short ranged escorting destroyers. Underway replenishment was performed almost exclusively by the USN during WWII. The UK's Royal Navy was trained by the USN and adopted the practice upon the arrival of the Far East Fleet in the Pacific in 1945. They were the only other navy to do so. Axis BB's need to either hove to and fuel while stationary (making themselves extremely vulnerable targets) or return to a fueling base.



Left: 26 Dec 1945 Los Angeles Harbor. BB64 at anchor. Note the large number of seagulls attracted by the dumping of Christmas Dinner garbage off the fantail via the chute on the port side of the stern. Note the ship's name and hull number in white. Also note the Movie Projection Screen rigged on the front of the aircraft crane. The extended height of the BB64's Sc4 fitted mainmast is readily apparent from this angle.dbc



Right: 27 Oct 1945 Hudson River NY Navy Day Review. President Truman aboard DD USS Renshaw DD499 has just passed the USS Missouri BB63. Smoke is visible from the 21 gun salute rendered to the President as the review ship passed. Overhead is a K type blimp. In the left background is the USS New York BB34.

28 June 2008 Suisun Bay CA (near San Francisco) National Defense Reserve Fleet (NDRF). "The last battleship" the USS Iowa BB61 waits to be moved to the former Mare Island Naval Shipyard at Vallejo Ca. for restoration as a memorial, to be opened to the public for tours and events. For information on assisting with the preservation effort of BB61 go to: **www.battleshipiowa.org** . Photo by author

Glossary of Acronyms and Abbreviations

AA	Anti Aircraft
AAW	Anti Aircraft Warfare
AG	Unclassified Miscellaneous Auxiliary
AGSL	Satellite Launch Ship
AOE	Replenishment Ship
ASuW	Anti Surface Warfare
ASW	Anti Submarine Warfare
BB	Battleship
BB(AA)	Anti Aircraft Battleship
BBG	Guided Missile Battleship
BBMG	Ballistic Guided Missile Monitor
CA	Heavy Cruiser
CAG	Guided Missile Heavy Cruiser
cal	Caliber
CB	Large Cruiser
CBC	Large Command Cruiser
CBG	Guided Missile Large Cruiser
CC	Battlecruiser
CG	Guide Missile Cruiser
CINC	Commander in Chief (US President)
CNO	Chief of Naval Operations
CIC	Combat Information Center
CS	Commando Ship/Heavy Assault Ship
CV	Fleet Carrier
CVB	Large Carrier
DD	Destroyer
DDE	Escort Destroyer
DP	Dual Purpose
FL	Full Load Displacement
Flt	Fleet
GM	Metacentric Height
GT	Gear Turbines
ICBM	Inter Continental Ballistic Missile
IOC	Initial Operational Capability
IRBM	Intermediate Range Ballistic Missile
LCVP	Landing Craft Vehicle Personnel
LPH	Amphibious Assault Ship (Helicopter)
MG	Machine Gun
mi	Statue Mile
MARAD	MARitime Administration
MK/Mk	Mark
Mod	Model
Ms	Measure (camouflage)
NAS	Naval Air Station
NATO	North Atlantic Treaty Organization
OA	Overall (length)
nm	Nautical Mile
NavAid	Navigational Aid
NSY	Naval ShipYard
PSI	Pounds per Square Inch
SC/SK/SK2	Air Search Radar Series
SCB	Ship Characteristics Board
SHP	Shaft Horse Power
SINS	Ship Inertial Navigation System
TACAN	TACtical Aid (to) Navigation
TE	Turbo Electric
TF	Task Force
TG	Task Group
TT	Torpedo Tube(s)
UN	United Nations
UNREP	UNderway REPlenishment
VTE	Vertical Triple Expansion
wl	Waterline (length)
WWII	World War Two

4 Jun 1954 off the Virginia Capes. For a few hours the four BB61 class battleships operated together as Battle Division 2 (BatDiv2). The ships are front to rear USS Iowa BB61 USS Wisconsin BB64 USS Missouri BB63 and USS New Jersey BB62. This was the only time all four ships of the Iowa class operated together. Paint is Ms13 with large hull numbers.

Photograph Credits

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Select Bibliography

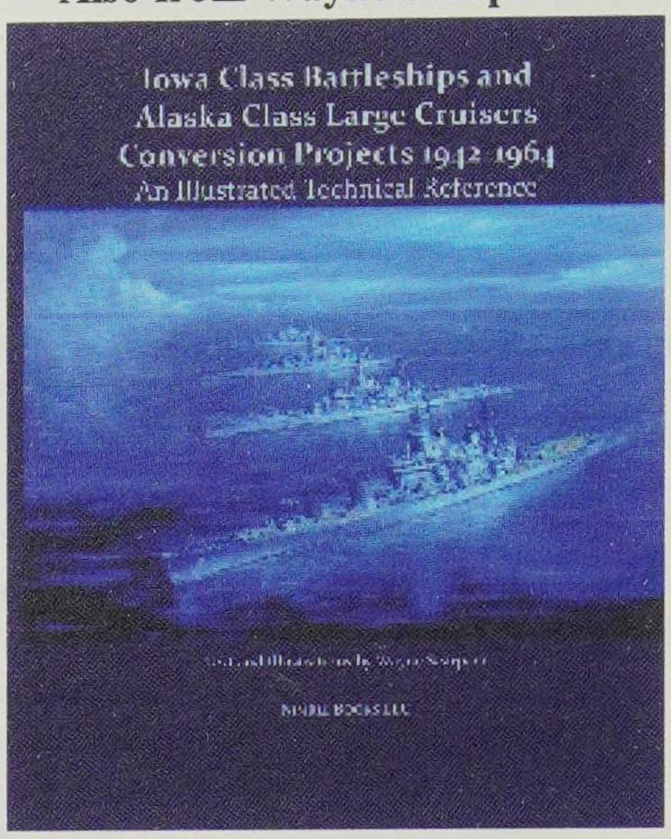
All the World's Battleships	I Sturgon	Conway Maritime	1996
Battleship and Cruiser Aircraft of the USN	W Larkins	Schiffer	1996
Battleship Design and Development	N Freidman	Mayflower Press	1978
Battleship Missouri	P Stillwell	USNI Press	1996
Battleship New Jersey	P Stillwell	USNI Press	1986
Battleships and Battlecruisers	S Breyer	Doubleday	1973
Battleship of WWII an International Encyclopedia	MJ Whitley	USNI Press	1998
Brassey's Naval Annual 1945 ed	HG Thursfield	Clowes&Sons	1945
Dictionary of American Naval Fighting Ships (DANFS)	Staff	USN HistoricalCtr	1959-81
Handbook on Ship Camouflage C&R-4 Ships-2	USN	Bureau of C&R	1937-45
Instructions for the painting of USN Vessels	USN	Bureau of Ships	1943
Iowa Class Battleships	FM Sumrall	Conway Maritime	1988
Jane's Fighting Ships 1945 1946 1952 1955 ed.	Staff	McGraw Hill	1939-58
Naval Camouflage 1914-1945	D Williams	USNI Press	2001
Naval Firepower	N Freidman	USNI Press	1981
Naval Radar	N Freidman	USNI Press	2001
Naval weapons of WWII	J Campbell	USNI Press	1985
Nuclear Weapons of the United States	J Gibson	Schiffer	1996
Ships and Aircraft of the US Fleet 1st-7th Editions	J Fahey	USNI Press	1988
US Battleships in WWII	Dulin/Garzke	USNI Press	1976
US Battleships in Action Volumes I&II	R Stern	Squadron/Signal	1980/84
US Battleships: an Illustrated Design History	N Freidman	USNI Press	1984
US Cruisers: an Illustrated Design History	N Freidman	USNI Press	1984
US Naval Vessels ONI 54 Sep 1943	USN	USNI Press	1986
US Naval Vessels ONI 222 Sep 1945	USN	Schiffer	1996
USS California BB44	Martin	Turner Pub	1997
USN Floatplanes in Action	A Adock	Squadron/Signal	2006
Warships of the World 1946	R Kafka	Cornell Maritime	1946
US Warships of WWII	P Silverstone	Doubleday	1968

Internet Resources

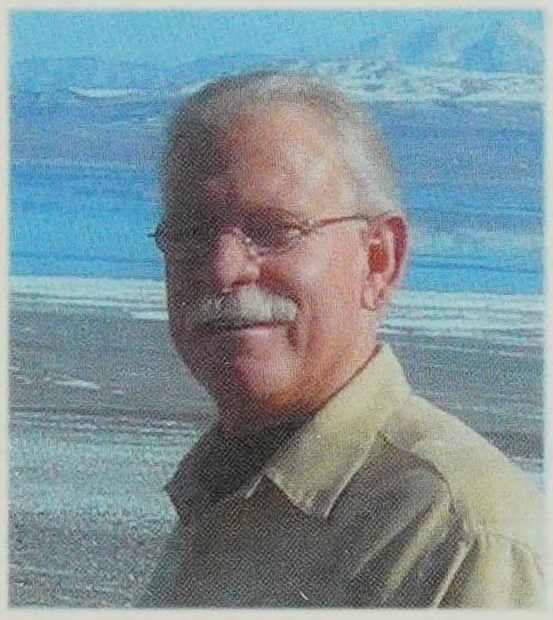
Floating Drydock	Ship and ordnance drawings	www.floatingdrydock.com
Naval Historical Center	Photos/Historical Data	www.history.navy.mil
Hazegray and Underway	Ships Histories/DANFS	www.hazegray.org
Naval Weapons	Weapons and Radar Data	www.navweaps.com
Navsource	Photographs	www.navsource.com
Snyder & Short Enterprises	Camouflage Information	www.shipcamouflage.com
Wikipedia Encyclopedia	History and Ships Data	www.wikipeadia.com

Sep 1961 Lipsett Bros. Newark NJ USS Alaska CB1 (L) and USS Washington BB56 (R) await scrapping. dbc.

Also from Wayne Scarpaci



35 page book on the proposed conversions of the Iowa Class BB's and Alaska Class CB's. 16 conversions described includes 11 pieces of original art and 11 line drawings available from
Amazon.com



About the Author: Born into a career navy family in 1950. I grew up on and around Ships and Naval Bases. I was aboard my 1st ship, the Fleet Tug USS Sarsi ATF 111 with my father at age 1 year. At age 2, I traveled to Guam aboard the USNS Barrett T-AP 196 and returned 3 years later aboard the USNS DE Aultman T-AP 156. We then lived moved to Virginia, finally relocating to San Diego in 1959 where my father finished out his Navy Career. After high school I served in the Army Nike Missile Program. After discharge I work as a Computer Technician on many ships and naval projects in the San Diego area. I also served part time in the California National Guard on 8" Self Propelled Howitzers. In 2001 my wife and I relocated to South Lake Tahoe to operate a motel. We again relocated in 2004 to Gardnerville NV to start a full time art business providing fine Naval and Rail Art. I currently reside in Northern Nevada with my India born wife Swarn and the family cat Cozy. This book is my second title and is intended as the first in an 8 volume series covering all the Capital Ships in the World's Navies during the WWII and Early Cold War Eras.

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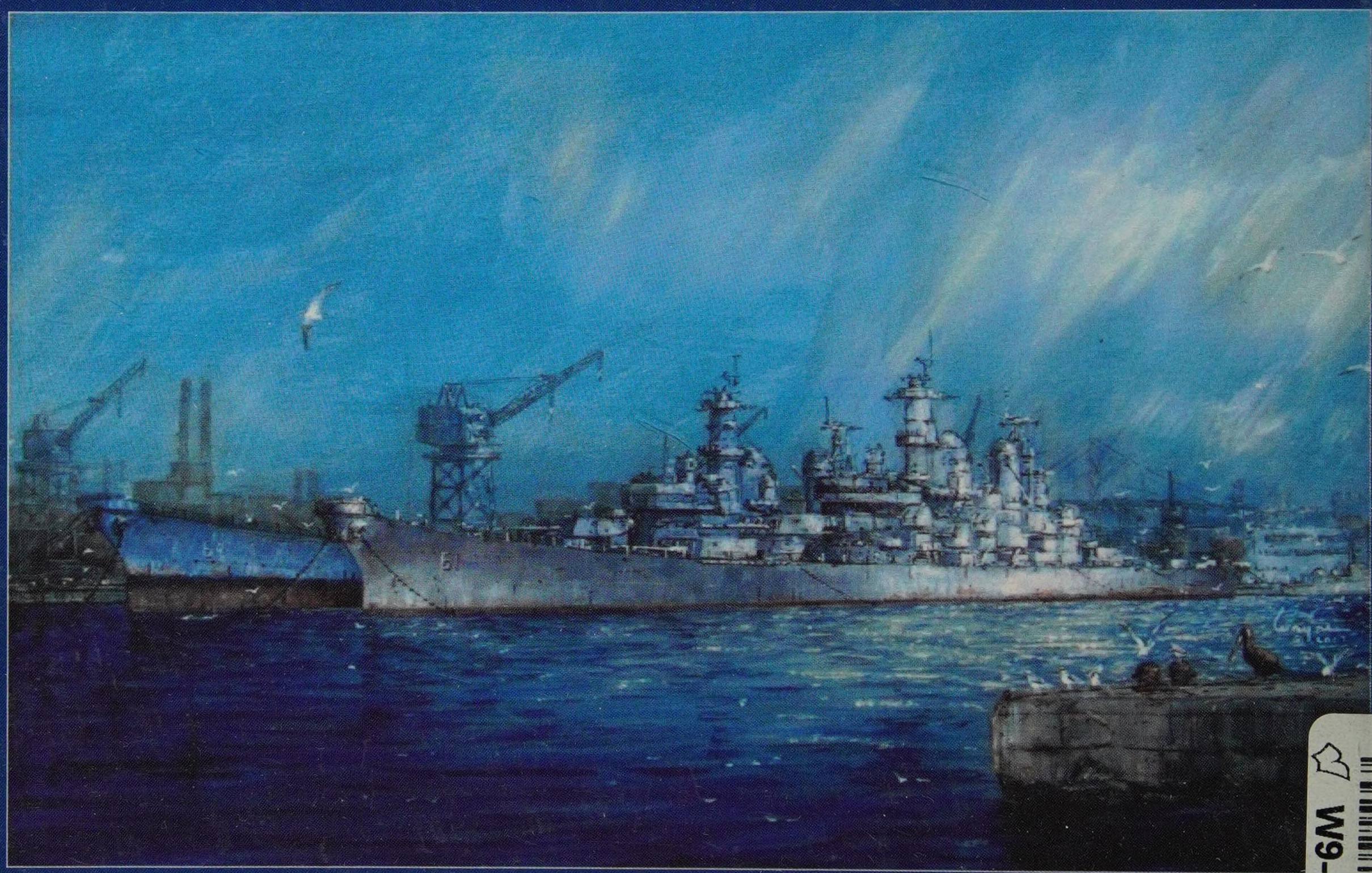

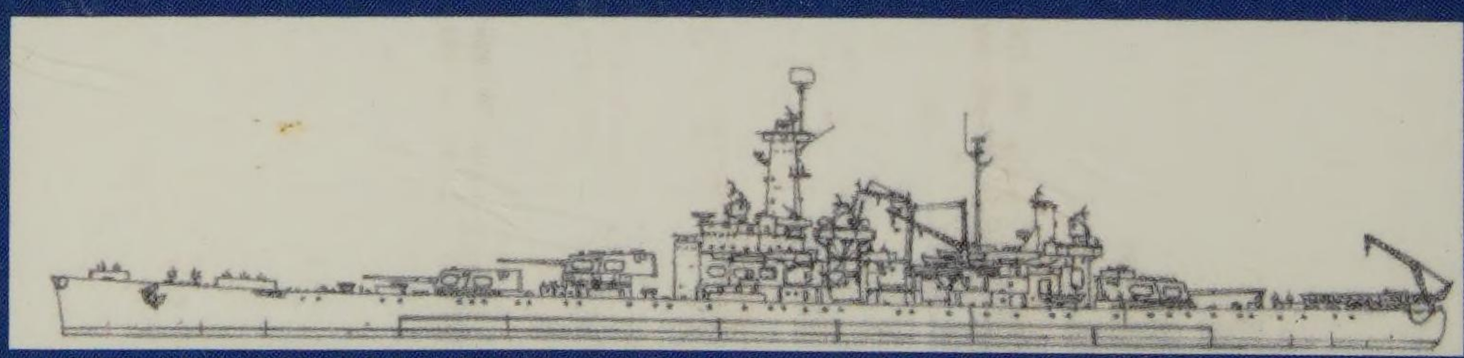

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